

THE LILIACEOUS GENUS *Polygonatum* IN NORTH AMERICA¹

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A cytotaxonomic study of the North American species of *Polygonatum* was begun by the writer in 1935 at the suggestion and under the direction of Dr. Edgar Anderson and Dr. J. M. Greenman. Most of the work was completed within the next three years. Publication was delayed, however, because there still remained several involved problems, and it was hoped that additional field study might provide answers to some unsettled questions. It now seems desirable, in view of recent publications on the group, to present the conclusions to date and to point out some of the problems yet to be solved.

HISTORY

The generic name *Polygonatum* is derived from the character of the rhizome and is explained by Miller² as follows:

"so call'd of *πολὸν* *much*, and *γωνὴ* a *Knee*, because it has many little Knees, for the Root is very knotty; It is also call'd *Solomon's-Seal*, because the Knots of the Root somewhat resemble a Seal."

The first use of the name *Polygonatum*, subsequent to the publication of Linnaeus's 'Species Plantarum' in 1753, was by Miller in the 'Abridgement' from 'The Gardener's Dictionary', published in 1754.³ Linnaeus⁴ listed three species of *Polygonatum* under the genus *Convallaria*, namely, *C. verticillata*, *C. Polygonatum* and *C. multiflora*. These were treated under the generic name *Polygonatum* by Allioni in 1785.⁵ The specific epithet of *Convallaria Polygonatum*, however, was changed to *officinale*. Thus, in accordance with the International Rules of Botanical Nomenclature, the name of the type species (*Convallaria Polygonatum* L.) becomes *Polygonatum officinale* All.

The first American species mentioned in literature is *Convallaria biflora*, described by Walter⁶ in 1788. In 1797, Poiret⁷ described *C. hirta* Bosc, a species

¹ An investigation carried out at the Missouri Botanical Garden in the graduate laboratory of the Henry Shaw School of Botany of Washington University. A preliminary report was submitted as a thesis in partial fulfillment of the requirements for the degree of Master of Science.

² Miller, Philip. The Gardeners Dictionary, ed. 1. 1731.

³ See Druce, G. Claridge. The abridgement of Miller's Gardener's Dictionary of 1754. Bot. Exch. Club & Soc. Brit. Isles Rept. 3:426-436. 1914, for a detailed account of this 'Abridgement', which seems to have escaped the notice of many botanical writers.

⁴ Linnaeus, C. Species plantarum, ed. 1. 1:315. 1753.

⁵ Allioni, Carlo. Flora pedemontana 1:130. 1785.

⁶ Walter, Thomas. Flora caroliniana, p. 122. 1788.

⁷ Poiret, J. L. M., in Lamarck, Encyclopédie méthodique. Botanique 4:369. 1797.

with hispid stems and pubescent leaves, said to have been sent from North America by Crevecoeur. However, no North American species with hispid stems is known to present-day botanists. In 1803, Michaux⁸ united all of the American species with the European *C. multiflora*. Willdenow,⁹ in 1806, described *C. pubescens* and *C. canaliculata* Mühl. In 1814, Pursh¹⁰ transferred all these species to *Polygonatum*, but changed the name *biflora* of Walter to *angustifolium*. He also added the European *P. latifolium* to his list of North American species. Poiret,¹¹ in 1816, described *Convallaria parviflora*, another species of doubtful affinities. Schultes¹² added *C. commutata* in 1830, and Dietrich¹³ proposed *Polygonatum giganteum* in 1835. In 1839, Hooker¹⁴ referred all of his American specimens to *P. multiflorum* β . *Americanum*. Torrey,¹⁵ in 1824, had recognized five species under *Convallaria*, but in 1843, he, too, referred them all to the European *P. multiflorum*.¹⁶ Wood,^{17, 18, 19} in the several editions of his 'Class-book of Botany' and in his 'American Botanist and Florist', considered the American species successively as varieties of *P. multiflorum* and of *P. biflorum*. In 1906, Greene²⁰ proposed three more species for the list, namely, *P. cuneatum*, *P. virginicum* and *P. boreale*. The New Mexican species was described by Wootton and Standley²¹ as *Salomonina cobrensis* in 1913. Recent editions of Gray's 'Manual'²² and Britton and Brown's 'Illustrated Flora'²³ recognize only two species, a pubescent one erroneously referred to as *P. biflorum*, and *P. commutatum* which includes the earlier *Convallaria biflora* of Walter.

More recent work on the genus has resulted in the description of numerous varieties and the making of various combinations. Farwell,²⁴ in 1915, reviewed the previous work on *Polygonatum*, divided the genus into two groups of species, the PUBESCENTES and the GLABRATA, and recognized in all five species and six varieties, several of which were proposed as new. In subsequent papers,^{25, 26, 27} he

⁸ Michaux, André. *Flora boreali-americana* 1:202. 1803.

⁹ Willdenow, Karl Ludwig. *Hortus berolinensis* 1:45, pl. 45. 1806.

¹⁰ Pursh, Frederick. *Flora americana septentrionalis* 1:234, 235. 1814.

¹¹ Poiret, J. L. M., in Lamarck, *Encyclopédie méthodique. Botanique. Suppl.* 4:29. 1816.

¹² Schultes, J. H., in Schultes & Schultes, *Systema vegetabilium* 7²:1669-1671. 1830.

¹³ Dietrich, A., in Otto & Dietrich, *Allgemeine Gartenzeitung* 3:222, 223. 1835.

¹⁴ Hooker, W. J. *Flora boreali-americana* 2:176. 1839.

¹⁵ Torrey, John. *A flora of the northern and middle sections of the United States*, pp. 356, 357. 1824.

¹⁶ Torrey, John. *A flora of the state of New York* 2:299. 1843.

¹⁷ Wood, Alphonso. *Class-book of botany*, ed. 1, p. 396. 1845; ed. 2, p. 553. 1847.

¹⁸ Wood, Alphonso. *Class-book of botany; flora of the United States and Canada*, p. 714. 1861.

¹⁹ Wood, Alphonso. *The American botanist and florist*, p. 346. 1870.

²⁰ Greene, E. L. *Leaflets of botanical observation and criticism* 1:181, 182. 1906.

²¹ Wootton, E. O., and P. C. Standley. *Descriptions of new plants preliminary to a report upon the flora of New Mexico. Contrib. U. S. Nat. Herb.* 16:109-196, pl. 48-50. 1913.

²² Gray's *New manual of botany*, ed. 7. Revised by B. L. Robinson and M. L. Fernald, p. 292. 1908.

²³ Britton, N. L., and Addison Brown. *An illustrated flora of the northern United States, Canada and the British possessions*, ed. 2. 1:521. 1913.

²⁴ Farwell, O. A. *Notes on the Michigan species of Polygonatum. Bull. Torr. Bot. Club* 42:247-258, pl. 12-18. 1915.

²⁵ Farwell, O. A. *Notes on the Michigan flora. Rept. Mich. Acad. Sci.* 20:161-195. 1918.

²⁶ Farwell, O. A. *Notes on the Michigan flora. III. Rept. Mich. Acad. Sci.* 22:177-185. 1921.

²⁷ Farwell, O. A. *Contributions to the botany of Michigan, No. 15. Am. Midl. Nat.* 11:72-85. 1928.

has described *P. melleum*, presented several minor additions, and considerably modified his earlier concepts. Gates,²⁸ in 1917, revised the genus for North America, recognizing *P. pubescens*, *P. biflorum*, *P. commutatum*, *P. giganteum* and *P. cobrense*, as well as several varieties. *P. birtum*, *P. canaliculatum* and *P. parviflorum* were included as doubtful or unidentified species. In 1927, Bush²⁹ accepted twelve North American species.

During the course of the present investigation, the writer has been able to examine many times the amount of herbarium material seen by any previous student of the problem. She has studied in the field all entities herein recognized with the exception of *P. biflorum* and *P. biflorum* var. *hebetifolium*, and at one time or another has had all of the entities except the latter under cultivation. From this abundant material it has been possible to establish the great variation which some of the biological species may exhibit, and to realize that many of the proposed segregates are nothing more than extreme individuals of no taxonomic importance. In the present treatment only four species, two of which are difficult if not impossible to separate completely on morphological grounds, and three varieties of one species are recognized. Only the North American species are discussed in this paper.

MORPHOLOGY

The diagnostic characters separating species in *Polygonatum*, as in many other genera of the Liliaceae, may easily escape notice. They are inconspicuous and often are obscured by extreme variability in size and aspect of the plants.

Underground parts.—The genus is characterized by the presence of creeping knotted branching rhizomes. These have been observed to vary only in size, this variation being correlated with the general size of the whole plant. Deam³⁰ reports that the rhizomes grow near the surface in *P. pubescens* and deep in the ground in *P. biflorum* and *P. commutatum*. This difference appears to be related to differences in habit and habitat.

Stem.—A single upright stem rises from the rhizome each year (or one from each branch of the rhizome). In all North American species the stem is glabrous. It may be terete or ancipital, or sometimes somewhat grooved or channelled, but this character is not definite enough to have much value in species delimitation. The stem is almost strictly vertical to arching to such a degree that the upper part is horizontal. The amount of arching seems due, at least in part, to the size of the plant. The proportion of the leafy to the naked part of the stem seems to be a good character to aid in separating some of the species and varieties. In *P. biflorum* the leafy part is shorter than the lower naked part; in *P. biflorum* var. *melleum* the leafy and naked parts are about equal in length; in *P. biflorum*

²⁸ Gates, R. R. A revision of the genus *Polygonatum* in North America. Bull. Torr. Bot. Club 44:117-126, pl. 4-6. 1917.

²⁹ Bush, B. F. The species of *Polygonatum*. Am. Midl. Nat. 10:385-400. 1927.

³⁰ Deam, Charles C. Flora of Indiana, pp. 319, 320. 1940.

var. *necopinum* and *P. commutatum* the leafy part is usually considerably longer than the naked part.

Leaves.—Some of the best diagnostic characters are to be found in the leaves, both in their shape and in the texture and surface characters. In all the North American species the leaves are alternate. They are broadly oval, elliptic, ovate-lanceolate or nearly linear, the size and shape varying considerably within each of the species. In most cases the leaves are about 2 to 4 times as long as broad, but in *P. biflorum* var. *hebetifolium* they are very long and narrow, being 5 to 9 times as long as broad. In *P. pubescens* and *P. cobrense* the leaves are shortly petiolate; in *P. biflorum* var. *melleum* they vary from sessile to shortly petiolate; in the others they are sessile. The nervation of the leaves presents a nearly constant character which can quite easily be used in the separation of entities. The leaves of *P. pubescens*, *P. biflorum* and vars. *hebetifolium* and *necopinum*, and *P. cobrense* have few major nerves, only the midrib being prominent for the full length of the leaf. The leaves of *P. biflorum* var. *melleum* and *P. commutatum* are many-nerved. In *P. biflorum* var. *melleum* the nerves are all nearly equal in size, prominent in the lower half of the leaf and gradually fading out above the middle of the leaf. In *P. commutatum* the many strong nerves are prominent the full length of the leaf, with the midrib somewhat larger than the rest. *P. pubescens* is easily separated from the other species by the pubescence on the lower surface of the leaves. The hairs are whitish, short, straight and regular. They are found on the minor longitudinal nerves, less frequently on the more prominent nerves. All other species have completely glabrous leaves.

The lowest leaf is a cauline bract, usually set on the stem at a sharper angle than the other leaves. In *P. pubescens* and *P. cobrense* this bract is papery and caducous. In *P. biflorum* and its varieties and in *P. commutatum* it is leaf-like, green and persistent.

Inflorescence.—In most of the species each axillary peduncle bears 1 or 2, or rarely 3, flowers. In *P. biflorum* var. *melleum* the number varies from 2 to 4. In *P. commutatum* there is great variation in the inflorescence, both in the number of flowers (1 to 15) and in the relative lengths of pedicels and peduncle; also the pedicels in one inflorescence are sometimes equal and sometimes very unequal. In *P. biflorum* var. *hebetifolium* the peduncles are very long and slender. Those in *P. pubescens* and *P. cobrense* are strongly and sharply deflexed.

Differences in the position of the lowest peduncle in *P. pubescens*, *P. biflorum* and *P. commutatum*, as pointed out by Deam in his 'Flora of Indiana', have been emphasized by Fernald,³¹ who reports that of the specimens examined by him the lowest peduncle was from the second axil in 66 per cent of the plants of *P. pubescens*, from the third axil in 59 per cent of those of *P. biflorum*, and from the fourth or fifth axil in 72 per cent of those of *P. commutatum*. These figures,

³¹ Fernald, M. L. Specific distinctions between *Polygonatum biflorum* and *P. canaliculatum*. *Rhodora* 46:9-12. 1944.

however, lose some of their significance when it is remembered that the first green "leaf" in *P. biflorum* and *P. commutatum* is actually a cauline bract, and that there is possibility for considerable error in separating these two species on morphological criteria alone.

Perianth.—The size and color of the perianth are of some value in distinguishing species. *P. pubescens* has the smallest flowers, usually 10 or 11 mm. long. The flowers of *P. biflorum* var. *melleum* are also quite small, 12 to 15 mm. long. The other species and varieties have larger flowers, up to 23 mm. long in *P. cobrense*, *P. biflorum* var. *hebetifolium* and *P. commutatum*. In *P. biflorum* var. *hebetifolium* and *P. cobrense* the flowers are larger in proportion to the size of the whole plant than in any other North American species. The flowers are yellowish green in *P. pubescens*, whitish in *P. biflorum* and var. *necopinum*, yellowish in *P. biflorum* var. *melleum* and *P. biflorum* var. *hebetifolium*, and greenish white tipped with darker green in *P. commutatum*. Flower shape may be a good distinguishing character for living plants, but it cannot always be used with entire success on herbarium material. The flowers of *P. pubescens* are broadest below the middle of the perianth tube; the tube is contracted at the base of the perianth lobes, and the lobes are somewhat spreading. The flowers of the other species are nearly cylindrical, being broadest at about the middle of the tube; the tube is not contracted at the base of the lobes, and the lobes are scarcely spreading.

Stamens.—The six stamens are inserted on the perianth tube, near the top of the tube in *P. pubescens*, at about the middle in the other species. The filaments of all species may be more or less papillose; they are densely so in *P. pubescens* and sometimes in *P. biflorum* var. *melleum*. In *P. biflorum* and its other varieties and in *P. cobrense* they are usually only slightly papillose. Those of *P. commutatum* vary from densely papillose to entirely smooth. The anthers are introrse.

Pistil.—The ovary is sessile to subsessile, oblong to globose, trilocular, with ovules several to a cell. The style is filiform, shorter than the perianth. The stigma is obtuse or capitate, and obscurely 3-lobed.

Fruit and seeds.—The fruit is a dark blue or black, globose, pulpy, several-seeded berry. The berries are usually larger and have more seeds in the larger *P. commutatum* than in the smaller plants of other species. The seeds are globose to more or less compressed, smooth, pale to brownish, with a stony endosperm.

CYTOLOGY

At the time the present study was undertaken very little was known of the cytology of the American species of *Polygonatum*. Incidental to other studies Cardiff³² had reported a haploid chromosome number of 7 or 8 in material identified as *Salomonina biflora*. His figure of a meiotic metaphase in this species shows 7 bivalents. In 1933, Cartledge³³ reported a haploid number of 10 in *P. biflorum*

³² Cardiff, Ira D. A study of synapsis and reduction. Bull. Torr. Bot. Club 33:271-303, pl. 12-15. 1906.

³³ Cartledge, J. L. Chromosomes of *Polygonatum*. Proc. Pennsylvania Acad. Sci. 7:78, 79. 1933.

and *P. commutatum*. Because of inaccuracies in the existing manuals of the region, it is likely that the former report should be referred to *P. pubescens* and the latter to *P. biflorum*. Chromosome studies on most of the species and varieties recognized in the present treatment were made by the writer independently of and several years in advance of the appearance of Eigsti's comprehensive cytological survey of the eastern North American species.³⁴ Eigsti reported chromosome counts on 19 collections of *Polygonatum* including *P. pubescens*, *P. biflorum*



Fig. 1. Chromosomes of *Polygonatum cobrense*. Drawn from Ownbey & Ownbey 1643, from Canyon of Sapillo Creek, Gila National Forest, Grant Co., New Mexico. Upper Left: Metaphase of first pollen grain mitosis, $n = 10$. Upper Right: First meiotic metaphase in pollen mother cell, showing ten bivalents in polar view. Below: Individual bivalents from a single cell, drawn separately in side view. Magnification X 1800.

and *P. commutatum* (the last reported as *P. canaliculatum*). His counts and localities are listed in table I along with the writer's counts on these same and other species and varieties from eleven additional localities. Eigsti's counts were determined from colchicine-treated pollen tube mitoses. His technique appears to give a much better preparation than the aceto-carmin smear technique used by the writer to study the chromosomes at meiosis and pollen grain mitosis. This is particularly true in tetraploid material where it was not always possible for her to be sure that the chromosome number is exactly twenty.

From the table it is evident that the haploid chromosome number in all North American species of *Polygonatum* studied in recent years is either 10 or 20. *P. pubescens*, *P. cobrense* and *P. biflorum* with varieties *melleum* and *necopinum* are diploid, $n = 10$. All tetraploid ($n = 20$) specimens studied thus far belong to *P. commutatum*.

Meiosis is regular in all diploid species studied, with the formation of 10 bivalents on the metaphase plate. In the tetraploid *P. commutatum*, however,

³⁴ Eigsti, O. J. A cytological investigation of *Polygonatum* using the colchicine-pollen tube technique. *Am. Journ. Bot.* 29:626-636. 1942.

TABLE I
SUMMARY OF RECENT CHROMOSOME COUNTS ON THE NORTH AMERICAN
SPECIES OF POLYGONATUM

Species	Locality	Collector	Chromosome Number	Investigator and Date
<i>P. pubescens</i>	Strafford Co., N. H.	A. R. Hodgdon	n=10	Eigsti '40
<i>P. pubescens</i> *	Tolland Co., Conn.	G. S. Torrey	n=10	Eigsti '41
<i>P. pubescens</i>	Franklin Co., Ohio	Clyde Jones	n=10	Eigsti '41
<i>P. pubescens</i>	Davidson Co., Tenn.	A. J. Sharp	n=10	Eigsti '41
<i>P. pubescens</i>	Washtenaw Co., Mich.	J. T. Baldwin, Jr.	n=10	Eigsti '40, '41
<i>P. pubescens</i>	Baraga Co., Mich.	Edgar Anderson	n=10	R. Ownbey '39
<i>P. pubescens</i>	Oneida Co., Wisc.	Ruth E. Peck	n=10	R. Peck '37
<i>P. pubescens</i>	Wabasha Co., Minn.	C. O. Rosendahl	n=10	Eigsti '41
<i>P. cobrense</i>	Grant Co., N. Mex.	M. Ownbey & R. Ownbey	n=10	Ownbey & Ownbey '42, '44
<i>P. biflorum</i>	Middlesex Co., N. J.	M. A. Chrysler	n=10	Eigsti '41
<i>P. biflorum</i>	Prince Georges Co., Md.	Ronald Bamford	n=10	Eigsti '41
<i>P. biflorum</i>	Leon Co., Fla.	H. Kurz	n=10	R. Ownbey '38, '39
<i>P. biflorum</i> var. <i>melleum</i>	St. Clair Co., Mich.	Edgar Anderson & R. Peck	n=10	R. Ownbey '38
<i>P. biflorum</i> var. <i>necopinum</i>	Pennington Co., S. Dak.	M. Ownbey & R. Ownbey	n=10	R. Ownbey '39
<i>P. commutatum</i> †	Floyd Co., Va.	J. T. Baldwin, Jr.	n=20	Eigsti '39, '40, '41
<i>P. commutatum</i>	Wythe Co., Va.	Edgar Anderson & Wm. Brown	n=20	R. Ownbey '39
<i>P. commutatum</i> †	Durham Co., N. C.	L. E. Anderson	n=20	Eigsti '40
<i>P. commutatum</i> †	Washtenaw Co., Mich.	J. T. Baldwin, Jr.	n=20	Eigsti '41
<i>P. commutatum</i> †	Elkhart Co., Ind.	O. J. Eigsti	n=20	Eigsti '41
<i>P. commutatum</i> †	Hennepin Co., Minn.	C. O. Rosendahl	n=20	Eigsti '41
<i>P. commutatum</i> †	Hennepin Co., Minn.	C. O. Rosendahl	n=20	Eigsti '41
<i>P. commutatum</i> †	Johnson Co., Iowa	W. A. Anderson	n=20	Eigsti '41
<i>P. commutatum</i> †	Monona Co., Iowa	George Goodman	n=20	Eigsti '41
<i>P. commutatum</i>	St. Louis Co., Mo.	Maude Lodewyks & R. Peck	n=20±	R. Peck '36
<i>P. commutatum</i>	St. Louis Co., Mo.	M. Ownbey	n=20±	R. Ownbey '38
<i>P. commutatum</i> †	Cole Co., Mo.	Mrs. H. H. Leake	n=20	Eigsti '41
<i>P. commutatum</i>	Butler Co., Mo.	Edgar Anderson	n=20±	R. Ownbey '38
<i>P. commutatum</i>	Caddo Parish, La.	Mrs. James L. Dorman	n=20±	R. Ownbey '39
<i>P. commutatum</i> †	Cleveland Co., Okla.	O. J. Eigsti	n=20	Eigsti '39, '40, '41
<i>P. commutatum</i> †	Cleveland Co., Okla.	O. J. Eigsti	n=20	Eigsti '40, '41

*Described as pubescent, and diploid, but listed as *P. canaliculatum*—obviously a mistake.

†Reported as *P. canaliculatum*, a name now considered to be synonymous with *P. biflorum* and unavailable, therefore, for the tetraploid species.

there appears to be always some multivalent formation. This may result in unequal distribution of the chromosomes to the daughter nuclei, possibly accounting for seeming variation from the expected 20 chromosomes at mitosis in the pollen grains. Such irregularities are much more likely to be evident at this division than later at the pollen tube mitosis studied by Eigsti.

No karyotypic differences between the species other than tetraploidy are reported by Eigsti. In all of the diploid species studied there are 6 long and 4 short chromosomes; 12 long and 8 short, in the tetraploid. Eigsti states that in the diploid species 6 chromosomes have sub-terminal and 4 have sub-median insertions; in the tetraploid, 12 chromosomes have sub-terminal, 8 have sub-median insertions. An examination of his photographs, however, reveals that in one-third of his collections of *P. pubescens* and in all of his collections of *P. biflorum* there are 5 chromosomes with sub-median and 5 with sub-terminal constrictions. This latter condition agrees with the writer's observations in *P. biflorum* var. *melleum* and *P. biflorum* var. *necopinum*. The chromosomes of *P. cobrense* are shown in fig. 1.

Stomata size and distribution have recently been suggested and found useful in certain groups of plants as a means of detecting polyploidy through the use of herbarium specimens.^{35, 36, 37} Sax and Sax found, in the genera which they investigated, that stomata frequency was a better index to polyploidy than stomata length. Babcock and Stebbins use stomata length. In *Polygonatum* also, stomata length is of more value. The chromosome numbers of the diploid *P. biflorum* and the tetraploid *P. commutatum* are correlated with either stomata measurement. In general, the stomata of *P. biflorum* are shorter and more frequent than those of *P. commutatum*, but there is considerable overlapping in the size and distribution ranges. In the diploid *P. pubescens*, the size of the stomata is similar to that in *P. biflorum*, but the frequency is like that in *P. commutatum*. The diploid *P. biflorum* var. *melleum* has very short stomata. On the other hand, *P. cobrense*, also diploid, and *P. biflorum* var. *hebetifolium*, whose chromosome number is unknown but whose morphology suggests that it is diploid, have stomata as long as the longest found in the tetraploid. Thus it is apparent that, although stomata size is of some use in separating the closely related diploid *P. biflorum* and tetraploid *P. commutatum*, it cannot be relied upon, in the genus as a whole, as a method of detecting polyploids.

In the species investigated, a much stronger correlation was found between stomata size and flower length than between stomata size and chromosome number. The flowers of *P. biflorum*, like the stomata, are usually but not always shorter than those of *P. commutatum*. *P. pubescens* and *P. biflorum* var. *melleum* have short flowers and stomata; *P. cobrense* and *P. biflorum* var. *hebetifolium* have very long flowers and stomata.

³⁵ Sax, K., and H. J. Sax. Stomata size and distribution in diploid and polyploid plants. Journ. Arnold Arboretum 18:164-172, pl. 205. 1937.

³⁶ Babcock, E. B., and G. L. Stebbins, Jr. The American species of *Crepis*, their interrelationships and distribution as affected by polyploidy and apomixis. Carnegie Inst. Wash. Publ. No. 504. 1938.

³⁷ Stebbins, G. L., Jr. Notes on some systematic relationships in the genus *Paeonia*. Univ. California Publ. Bot. 19:245-266. 1939.

DISTRIBUTION

Polygonatum is widely distributed in north temperate regions. There are many more species in Europe and in temperate Asia than in North America, but these have not been studied in this investigation. In North America, the genus is found from the Atlantic Ocean to the Black Hills of South Dakota, and from southern Canada to northeastern Mexico. One species, *P. cobrense*, occurs in a restricted area in southwestern New Mexico and eastern Arizona.

GENERIC RELATIONSHIP

The two genera perhaps most closely related to *Polygonatum* are *Streptopus* and *Disporum*, both with extensive north temperate ranges. Baker³⁸ included *Polygonatum* with *Convallaria* and other genera in the tribe Convallarieae of the Asparagaceae. What is perhaps a better way to treat the genus is that found in Bentham and Hooker's 'Genera Plantarum',³⁹ where it is included with *Streptopus*, *Disporum*, *Smilacina*, *Maianthemum*, etc., in the tribe Polygonateae of the Liliaceae, and in Engler and Prantl's 'Natürlichen Pflanzenfamilien',⁴⁰ where it is placed with *Clintonia*, *Tovaria* [*Smilacina*], *Majanthemum*, *Disporum*, *Streptopus*, etc., in the Asparagoideae-Polygonateae of the Liliaceae.

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ABBREVIATIONS

The herbaria from which loans of material for study have been obtained and from which citations are made in this treatment are indicated by the following abbreviations:

- C—Herbarium of the National Museum of Canada.
- D—Personal Herbarium of Charles C. Deam.
- F—Farwell—Personal Herbarium of O. A. Farwell.
- FM—Herbarium of the Chicago Museum of Natural History (Field Museum).
- G—Gray Herbarium of Harvard University.

³⁸ Baker, J. G. Revision of the genera and species of Asparagaceae. Journ. Linn. Soc. [Lond.] Bot. 14:508-632, pl. 17-20. 1875.

³⁹ Bentham, G., and J. D. Hooker. Genera Plantarum 3²:768, 769. 1883.

⁴⁰ Krause, K., in Engler & Prantl, Die natürlichen Pflanzenfamilien, 2. Aufl. 15a:368-370. 1930.

- M—Herbarium of the Missouri Botanical Garden.
 Minn—Herbarium of the University of Minnesota.
 MS—Herbarium of the Michigan State College of Agriculture.
 NY—Herbarium of the New York Botanical Garden.
 NYCP—Herbarium of the New York College of Pharmacy.
 RM—Rocky Mountain Herbarium of the University of Wyoming.
 UF—Herbarium of the Agricultural Experiment Station, University of Florida.
 UM—Herbarium of the University of Michigan.
 US—United States National Herbarium.
 WS—Herbarium of the State College of Washington.
 WVU—Herbarium of West Virginia University.

TAXONOMY

Polygonatum [Tourn.] Miller, Gard. Dict. Abridg., ed. 4. 1754, in part; Adans., Fam. 2:54. 1763; All., Fl. Ped. 1:130. 1785, in major part; Baker in Journ. Linn. Soc. [Lond.] Bot. 14:552-561. 1875; Benth. & Hook., Gen. Pl. 3²:768, 769. 1883; Krause in Engler & Prantl, Nat. Pflanzenf. 2. Aufl. 15a:368-370. 1930.

- Convallaria* L., Gen. Pl., ed. 5, p. 148. 1754, in part.
Salomonina Heist. ex Fabricius, Enum. Pl. Hort. Helmstad., ed. 2, p. 38. 1763.
Evallaria Neck., Elem. 3:189. 1790.
Axillaria Rafin. in Journ. Phys. 89:261. 1819.
Siphyalis Rafin., Fl. Tellur. 4:17. 1836.
Campydorum Salisb., Gen. Pl. Fragm., p. 64. 1866.
Sigillum [Trag. ex] Montand., Guide Bot., p. 310. 1868.
Periballanthus Franch. & Sav., Enum. Pl. Jap. 2:524. 1879.

Perennial herbs with horizontal, creeping, knotted rhizomes and fibrous roots; stem erect or arching, unbranched, glabrous or pubescent (glabrous in all North American species), naked below, leafy above, with one or more papery sheathing bracts at the base; leaves alternate, opposite or verticillate (alternate in all North American species), amplexicaul, sessile, or shortly petiolate, broadly oval to ovate-lanceolate to linear, glabrous on both sides or with a fine pubescence on the veins below; inflorescence axillary, the solitary peduncles each bearing a single flower, or two or more jointed pedicels each bearing a flower; peduncles and pedicels glabrous or pubescent (glabrous in all North American species); floral bracts much reduced, subulate, caducous; flowers pendulous, with the calyx and corolla united into a cylindrical tube, 6-lobed at the top; perianth lobes usually shorter than the tube, sometimes spreading in the mature flower, glandulose-barbate at the tip inside; stamens six, included, inserted on the perianth tube; filaments filiform or flattened, smooth to roughly papillose; anthers oblong-linear to sagittate, 2-lobed at the base, introrse; ovary sessile to subsessile, oblong to globose, 3-locular; style filiform, shorter than the perianth; stigma obtuse or capitate, obscurely 3-lobed; ovules several in a cell; fruit a dark blue or black, globose, pulpy, several-seeded berry; seeds globose to more or less compressed, smooth, pale to brownish, with stony endosperm.

TYPE SPECIES: *Convallaria Polygonatum* L., Sp. Pl. 1:315. 1753 (= *Polygonatum officinale* All., Fl. Ped. 1:131. 1785).

KEY TO THE SPECIES AND VARIETIES

- a. Cauline bract papery, caducous; peduncles strongly and sharply deflexed.
- b. Leaves pubescent on the veins beneath; flowers small, 8 to 14 (usually 10 or 11) mm. long; perianth tube constricted at base of lobes, lobes spreading at anthesis; filaments inserted near the top of the tube; diploid ($n = 10$)..... 1. *P. pubescens*
- bb. Leaves glabrous on both sides; flowers large, 17 to 23 mm. long; perianth tube cylindrical, not constricted, lobes erect at anthesis; filaments inserted near the middle of the tube; diploid ($n = 10$).... 2. *P. cobrense*
- aa. Cauline bract green, leaf-like, persistent; peduncles arcuate, not strongly deflexed; plant entirely glabrous; flowers usually 12 to 23 mm. long; perianth tube cylindrical, not constricted, lobes scarcely spreading; filaments inserted near the middle of the tube.
- c. Chromosome complement diploid ($n = 10$);* plants dainty, usually less than 6 dm. high; peduncles 1- or 2 (to 4)-flowered; leaves with only the mid-vein prominent for the full length.
- d. Upper leafy portion of the stem usually shorter than lower naked portion; leaves elliptic-lanceolate, few-nerved; peduncles 1- or 2-flowered; flowers 11 to 19 (usually 13 to 15) mm. long; widespread in eastern United States..... 3. *P. biflorum*
- dd. Upper leafy portion of the stem about equalling lower naked portion in length; leaves variable in shape, elliptic-lanceolate to broadly elliptic, many-nerved; peduncles 2- to 4-flowered; flowers 12 to 15 mm. long; Michigan and Ontario, in the vicinity of Lake St. Clair..... 3a. *P. biflorum* var. *melleum*
- ddd. Upper leafy portion of the stem about equalling lower naked portion in length; leaves oblong-lanceolate, 5 to 9 times as long as broad, few-nerved; peduncles 1- or 2-flowered; flowers large, 20 to 23 mm. long; along the Apalachicola River, western Florida..... 3b. *P. biflorum* var. *hebetifolium*
- dddd. Upper leafy portion of the stem longer than lower naked portion; leaves elliptic-lanceolate, few-nerved; peduncles 2-flowered; flowers 15 to 17 mm. long; Black Hills of South Dakota.... 3c. *P. biflorum* var. *necopinum*
- cc. Chromosome complement tetraploid ($n = 20$); plants generally coarser, more robust, usually more than 6 dm. high, often much larger; peduncles 1- to 15 (usually 3 or more)-flowered; leaves with numerous veins prominent the full length; upper leafy portion of the stem usually longer than the lower naked portion..... 4. *P. commutatum*

* Chromosome number given at the beginning of the paragraph here because it is the best character separating *P. biflorum* and *P. commutatum*; in other places it is supplementary information.

1. *Polygonatum pubescens* (Willdenow) Pursh, Fl. Am. Sept. 1:234. 1814.

Convallaria pubescens Willdenow, Hort. Berol. 1:45, pl. 45. 1806.⁴¹

Polygonatum multiflorum β . *pubescens* Wood, Class-book of Bot., ed. 1, p. 396. 1845.

Polygonatum multiflorum β . *americanum* Hooker, Fl. Bor. Am. 2:176. 1839 (apparently typical part).

Polygonatum biflorum sensu A. Gray, Manual, ed. 2, p. 466. 1856, and subsequent editions, not *P. biflorum* (Walter) Elliott, Sketch Bot. S. C. & Ga. 1:393. 1817.

Polygonatum multiflorum δ . *latifolium* Wood, Class-book of Bot. Fl. U. S. & Can., p. 714. 1861.

Polygonatum biflorum γ . *latifolium* Wood, Am. Bot. & Flor., p. 346. 1870.

Polygonatum cuneatum Greene, Leaflets 1:181. 1906.

Polygonatum pubescens var. *cuneatum* Farwell in Bull. Torr. Bot. Club 42:253, pl. 13, B. 1915; Am. Midl. Nat. 11:77. 1928.

⁴¹ Synonyms are cited chronologically according to type.

Polygonatum pubescens f. *cuneatum* Victorin in Contrib. Lab. Bot. Univ. Montreal 14:28. 1929.

Polygonatum boreale Greene, Leaflets 1:181. 1906.

Polygonatum pubescens var. *boreale* Farwell in Am. Midl. Nat. 11:76. 1928.

Polygonatum boreale var. *australe* Farwell in Bull. Torr. Bot. Club 42:254, pl. 14, B. 1915.

Polygonatum pubescens australe Gates in Bull. Torr. Bot. Club 44:119, pl. 4, A. 1917.

Polygonatum pubescens var. *boreale* subvar. *australe* Farwell in Am. Midl. Nat. 11:77. 1928.

Polygonatum boreale var. *multiflorum* Farwell in Rept. Mich. Acad. Sci. 20:170. 1918.

Polygonatum Farwellii Bush in Am. Midl. Nat. 10:390. 1927.

Polygonatum pubescens var. *multiflorum* Farwell in Am. Midl. Nat. 11:77. 1928.

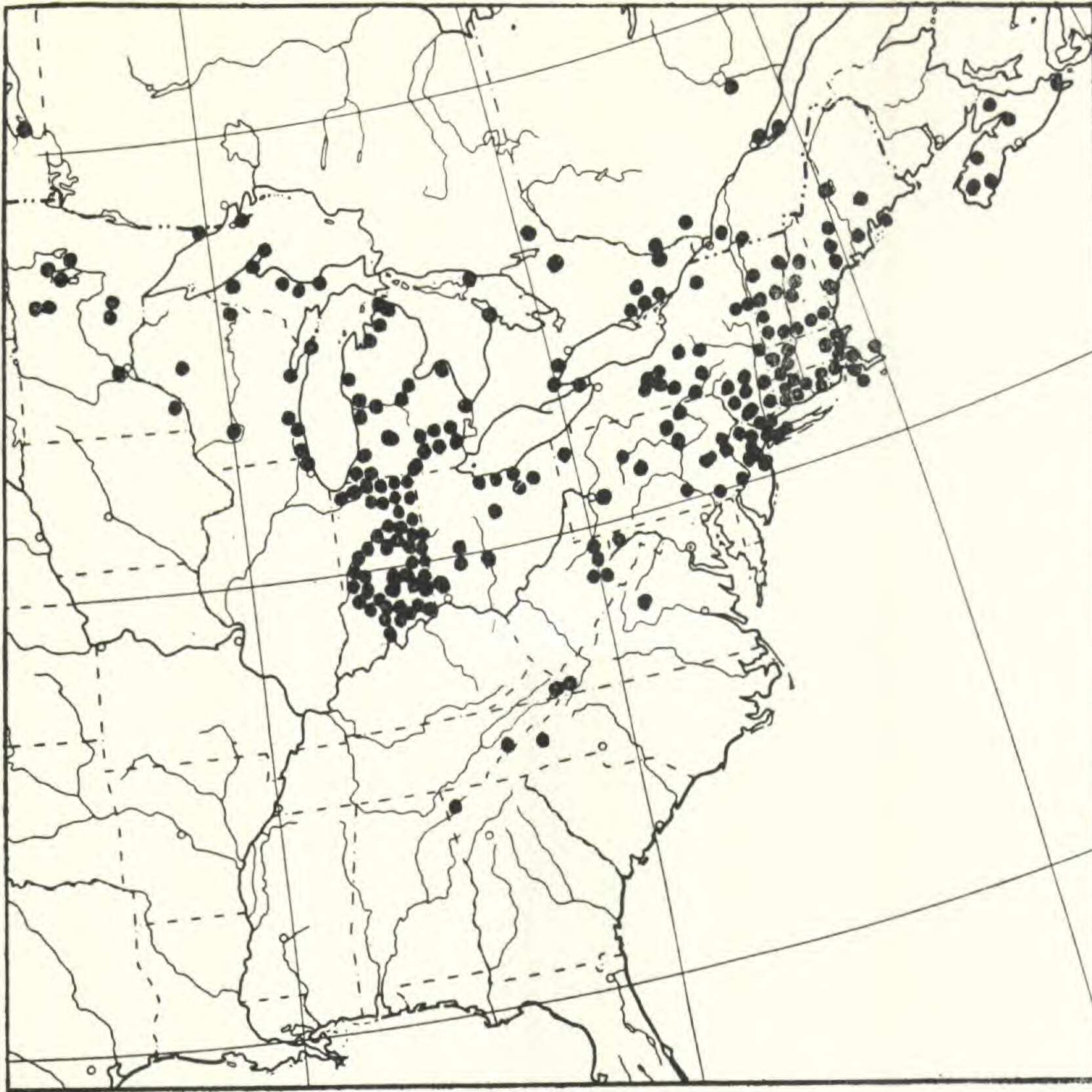
Polygonatum pubescens f. *fultius* Fernald & Harris in Rhodora 35:404, fig. 1. 1933.

Perennial herb, usually 3 to 6, but occasionally as much as 9 dm. high; rhizome slender; stem slender, erect or slightly arched at top, upper leafy portion of stem shorter than lower naked portion; leaves alternate, frequently secund, elliptic-lanceolate to elliptic or broadly oval, narrowed at the base to a short petiole, blade rounded to cuneate at the base, narrowed abruptly to an obtuse apex, 3.5 to 15 cm. long, 1 to 7 cm. broad, glabrous above, glaucous, often minutely papillose, and with a fine pubescence on the minor nerves beneath, prominent nerves 3 to 9; cauline bract subulate, papery, caducous; peduncles axillary, solitary, slender, glabrous, strongly and sharply deflexed, usually none from the axil of the lowest leaf, usually 1- or 2 (occasionally 3 to 5)-flowered; pedicels slender, glabrous, subequal, usually shorter than the peduncle; flowers yellowish green, smaller than in the other North American species; perianth 8 to 14 (usually 10 or 11) mm. long, 2.5 to 5 mm. broad in pressed material, contracted at the base of the perianth lobes, minutely papillose inside; lobes of the perianth spreading at anthesis, papillose inside; filaments densely papillose, inserted near the top of the perianth tube; berry dark blue, usually between 7 and 10 mm. in diameter.

This species is easily distinguished by its pubescent leaves, deflexed peduncles and small flowers, with the perianth tube contracted at the base of the spreading lobes and the stamens inserted near the top of the tube. The numerous varieties which have been proposed were based mostly on leaf shape and size alone, and appear to be mere phases of a continuous series. None appears to have a significant geographical distribution. The larger, more vigorous-looking plants may have peduncles with from 3 to 5 flowers.

DISTRIBUTION: In usually moist, rich woods, Nova Scotia and New England, south along the Appalachian Mountains to northern Georgia, west to Indiana, Illinois, Wisconsin, Minnesota, and Manitoba (Map 1).

NOVA SCOTIA. GUYSBOROUGH CO.: Boylston, June, 1890, *Hamilton* (C). **COLCHESTER CO.:** wooded banks, Truro, June 11, 1883, *Macoun* (C). **CUMBERLAND CO.:** dryish woods along Kennedy Brook, Springhill Junction, July 18, 1920, *Pease & Long* 20756 (G). **LUNENBURG CO.:** Bridgewater, July 21, 1910, *Macoun* (C, FM). **ANNAPOLIS CO.:** mixed woods, south slope of North Mt., n. of Middleton, July 21, 1920, *Long* 20757 (C,



Map 1. Distribution of *Polygonatum pubescens*. Since the map was made, additional specimens from New Jersey, West Virginia and Ohio have been seen. Based on Goode Base Map No. 102. By permission of The University of Chicago Press.

G). DIGBY CO.: moist thickets and borders of woods, Hectanooga, July 31, 1920, *Long & Linder 20758* (G).

QUEBEC. LAKE ST. JOHN CO.: on boulders, margins of woods, vicinity of St. Jerome, Laurentide Mts., June 30, 1920, *Victorin 10016* (G). MONTMORENCY CO.: exposed rocks, Grosse Isle, 40 mi. below Quebec, Aug. 28, 1922, *Victorin 16004* (G, US). QUEBEC CO.: Montmorency Falls, June 28, 1905, *Macoun* (C). MISSISQUOI CO.: dry limestone ledge, Philipsburg, Aug. 10, 11, 1923, *Knowlton* (G); woods, limestone, Philipsburg, May 24, 1930, *Victorin & Germain 34161* (G). CHAMBLY (?) CO.: Montagne de Beloeil, June 1, 1920, *Victorin 11005* (G). TERREBONNE CO.: woods, Lac Tremelant, July 31, 1922, *Churchill* (G). HULL CO.: rich woods, Hull, May 27, June 10, 1905, *Harrington 2285* (C); Hull cemetery, June 3, 1911, *Macoun* (C).

ONTARIO. CARLETON CO.: woods, Ottawa, May 28, 1893, *Macoun* (C); Ottawa, Aug. 20, 1894, *Macoun* (G); woods, McKays Bush, Ottawa, Aug. 21, 1894, *Macoun* (C); Dows swamp, by Rideau River, above Billings Bridge, May 21, 1903, *Macoun* (C). LEEDS CO.: Jones Falls, May 26, 1891, *Fowler* (US). FRONTENAC CO.: Battersea, June 1, 1893, *Fowler* (M, MS); Sharbot Lake, July 16, 1898, *Fowler* (FM). HASTINGS CO.: rich woods, vicinity of Belleville, May 30, 1877, *Macoun* (C). PEEL CO.: woods, Snelgrove, June 3, 1898, *White* (C). WENTWORTH CO.: woods, West End Spring, Hamilton, 1892, *Dickson* (C). WELLAND CO.: Point Abino, Lake Erie, Aug. 28, 1896, A.A.A.S.

Excursion (NY). NIPISSING DIST.: Skunk Lake Portage, Timagami Provincial Forest, Aug. 25, 1932, *Krotkov 5231* (G); rich woods, Cache Lake, Algonquin Park, June 12, 1900, *Macoun* (C). MANITOULIN DIST.: crevices and talus of hornblend cliffs and ledges, Cloche Peninsula, June 29, 1934, *Fernald & Pease 3239* (G). BRUCE CO.: maple grove, Lake Ira, Bruce Peninsula, June 4, 1934, *Krotkov 8854* (G).

MANITOBA. DISTRICT NOT DETERMINED: Lake Winnipeg Valley, 1851, *Bourgeau* (G).

MAINE. PENOBSCOT CO.: Orono, June, 1895, *Keinstead 1020* (US). HANCOCK CO.: trail between Jordans Pond and Eagle Lake, Mt. Desert, June 28, 1889, *Redfield 16438* (M). KNOX CO.: Union, 1916, *Cole 271* (US); rich shaded woods, near Washington Pond, 3 mi. n. of Washington, Aug. 24, 1929, *Steyermark 881* (M). SOMERSET CO.: Kineo, Sept. 13, 1893, *Kennedy* (G). FRANKLIN CO.: damp woodland, South Chester-ville, May 18, 1902, *Eaton* (G). OXFORD CO.: Hartford, May, 1885, *Parlin* (G); dry wooded banks, Buckfield, Aug., 1895, *Parlin* (Minn). CUMBERLAND CO.: North Gray, July 10, 1915, *Fellows 7109* (US). YORK CO.: thin woods, South Berwick, May 27, 1934, *Neal 97* (Minn).

NEW HAMPSHIRE. COOS CO.: Randolph, Sept. 2, 1903, *Moore 1465* (G). GRAFTON CO.: rich woods, Hanover, May, 1936, *Beetle 240* (WS), *1098* (RM); alluvial woods, North Woodstock, July 15, 1915, *Fernald 11647* (G); Hanover, May 25, 1883, *Hitchcock* (M, Minn). ROCKINGHAM CO.: wooded bank of pond, Derry, Aug. 25, 1917, *Batchelder* (NY). HILLSBORO CO.: rich damp woods, Wilton, May 16, 1929, *Beattie* (RM); wooded roadside, Mason, May 28, 1914, *Batchelder* (US); wooded roadside bank, Merrimack, June 2, 1920, *Batchelder* (M); wooded roadside, Peterborough, Sept. 13, 1927, *Batchelder* (M). CHESHIRE CO.: woods, Jaffrey, July, 1897, *Robinson 202* (G).

VERMONT. CALEDONIA CO.: Peacham, May 22, 1887, *Blanchard* (FM, M, NY, RM, US). ORANGE CO.: palisades, Fairlee, July 6, 1927, *Mathias 140* (M, NY). CHITTENDEN CO.: Charlotte, May 26, 1878, *Horsford* (FM); rich moist woods, Milton, May 22, 1936, *Knowlton* (D). ADDISON CO.: rich woods, Bristol, July 11, 1935, *Knowlton* (D). RUTLAND CO.: woods, edge of Scanlon swamp, Brandon, May 16, 1921, *Dutton* (FM, M). BENNINGTON CO.: East Dorset, July, 1867, *Ames* (UM); Manchester, July 7, 1898, *Day 173* (FM, G, US). WINDHAM CO.: Westminster, Aug. 26, 1848, *Holton* (FM); at edge of woods on top of moist cliff, Wardsboro, May 26, 1937, *Moldenke & Moldenke 9593* (NY); woods, Westminster, June 16, 1898, *Robinson 47* (G).

MASSACHUSETTS. ESSEX CO.: moist woods, Essex Lakes, Hamilton, May 26, 1870, *Morong* (NY); Beverly, Sept., 1892, *ex herb. Peabody* (G); Marblehead, June 5, 1900, *Piper* (WS). MIDDLESEX CO.: woods, Horn Pond Mt., Woburn, May 14, 1905, *Bartlett 70* (UM); Westford, *Fletcher* (G); Seavers Woods, near boundary between Newton and Weston, May, 1893, *ex herb. Gilbert* (G); Auburndale, May 23, 27, 1894, *ex herb. Gilbert* (G); fresh pond, Cambridge, *Gray* (G); Stony Brook, May 15, 1897, *Greenman 2288* (M); rich woods, Shirley, May 30, 1914, *Hunnewell & St. John 1608* (WS); damp woods, Melrose, May 30, 1876, *Morong* (M); Ashland, June 30, 1877, *ex herb. Morong* (NY); open woods along Estabrook road, vicinity of Concord, May 27, 1915, *Norton 195* (US); Arlington, May 22, 24, 1900, *Piper* (WS); South Framingham, May 14, 1890, *Sturtevant* (M); vicinity of Cambridge, May 30, 1891, *Underwood 2760* (NY). SUFFOLK CO.: near Boston, 1816, *Boott* (US); Oak Island, May 23, 1897, *Greenman 2284* (M); Revere, Aug. 28, 1882, *Perkins* (C). NORFOLK CO.: cleft in rock, Stoughton, May 13, 1909, *Blake* (US); Blue Hills, May 28, 1854, *ex herb. Boott* (G); Brookline, *ex herb. Faxon* (G); Wellesley, May 18, 1889, *ex herb. Harlow* (NY); Blue Hill, near entrance to Blue Hill Reservation, Milton, May 20, 1911, *Kennedy* (G); Milton, May 27, 1900, *Murdoch 471* (FM). PLYMOUTH CO.: Middleboro, June 20, 1902, *Murdoch 1134* (FM). BARNSTABLE CO.: Provincetown, May 22, 1907, *Greenman 3013* (M); Provincetown, Sept. 2-11, 1901, *Hollick* (NY). DUKES CO.: Chappaquiddick Island, Sept. 15, 1917, *Bicknell* (NY); damp woods, near brook, Menemsha, Chilmark, June 10, 1917, *Seymour 1154* (G, US); low ground, off North Road, Chilmark, June 10, 1917, *Seymour 1899* (G); woods, West Tisbury, June 8, 1917, *Seymour 1900* (G). BRISTOL CO.: Nonquit, May 29, 1889, *Sturtevant* (M). FRANKLIN CO.: Sugar Loaf, 1818, *ex herb. Cooley* (MS); Sunderland, May 25, 1880, *Minott* (US); cool rich woods, Monroe Bridge, Mon-

roe, May 15, 1915, *St. John & Hill 11999* (WS); Ashfield, Aug. 8, 1909, *Williams* (G). HAMPSHIRE CO.: Amherst, May, 1890, *Morris* (Minn); roadside banks in wooded country, Huntington, Aug. 17, 1912, *Robinson 485* (G). HAMPDEN CO.: Russell, May 31, 1873, *Rusby* (UM); shaded brookside, Russell, May 17, 1913, *St. John & White 90* (WS). BERKSHIRE CO.: hedgerow, Adams, Aug. 27, 1901, *Day 101* (G); steep rocky wooded slope, North Adams, June 23, 1913, *Fernald & Long 9248* (G).

RHODE ISLAND. PROVIDENCE CO.: Cat Swamp, Providence, May 24, 1900, *Chamberlain 86* (US); woods, Providence, June, 1866, *Thurber* (G); Lonsdale, May 15, 1904, *Williams* (G).

CONNECTICUT. WINDHAM CO.: dry, but rich, woods and thickets, Thompson, May 17, 1918, *Weatherby 4224* (US). NEW LONDON CO.: damp rocky woods, Center Groton, Groton, May 28, 1933, *Jansson* (RM); Greeneville, June 3, 1885, *Lumsden* (C). MIDDLESEX CO.: Middletown, June, 1830, *Buckley* (M). HARTFORD CO.: fence rows, Southington, June 29, 1898, *Andrews 348* (G); hedges and fence rows, Southington, May 30, 1898, *Andrews 349* (G); woods, Southington, May 7, 1897, *Bissell 209-2659* (M); Glastonbury, May 28, 1932, *Denslow* (NY); Wethersfield, June, July, 1875, *Wright* (G); Farmington, June 4, 1884, *Wright* (M). NEW HAVEN CO.: New Haven, May 20, 1884, *Safford 42* (US). LITCHFIELD CO.: wooded trap-rocks, Woodbury, June 14, 1933, *Eames 11546* (G). FAIRFIELD CO.: Fairfield, May 17, 1895, *Eames* (US); edge of rich woods, Fairfield, May 17, 1896, *Eames I* (G); Easton, May 10, 1905, *Eames & Godfrey 69* (UF); Redding, June 28, 1905, *Godfrey* (UF); vicinity of Greens Farms, July 5, 1894, *Pollard 144* (US).

NEW YORK. WARREN CO.: sandy roadside woods, w. of Odels, w. of Lake Sunnyside, n. of Glens Falls, Aug. 24, 1916, *Burnham* (G). WASHINGTON CO.: gravelly sandy woods, near Tripoli Cemetery, southern West Fort Ann, May 31, 1915, *Burnham* (G); road, Podunk to Wiggins mine, West Fort Ann, June 8, 1917, *Burnham* (G). RENSSELAER CO.: Troy, 1828, 1834, *Hall* (FM). COLUMBIA CO.: near Turedy Lake, May 30, 1926, *Beale & party* (NY); woods, Copake Falls, Aug. 28, 29, 1914, *Britton, Taylor & Stetson* (NY). GREENE CO.: Windham, July 28-31, 1909, *Taylor 864* (NY); Onteora, vicinity of Tannersville, July 2, 20, 1891, *Vail* (NY). DELAWARE CO.: Arkville, May 29-31, 1915, *Mulford & Wilson* (NY). DUTCHESS CO.: rich woods, vicinity of Clove, Sept. 7, 1915, *Standley & Bollman 12389* (US). ULSTER CO.: Panther Mt., Aug. 14, 1919, *Denslow* (NY); Shandaken, Aug. 30, 1919, *Denslow* (NY). SULLIVAN CO.: woods, near Wurtsboro, June, 1873, *Eggert* (M). ORANGE CO.: Southfields, Tuxedo, May 10, 1922, *Denslow* (NY); Otisville, Aug. 30, 1922, *Denslow* (NY); Goshen, Aug. 31, 1922, *Denslow* (NY); woodland, Highland Falls, May 23, 1915, *Pennell 2395* (NY). WEST-CHESTER CO.: woods, Bronxdale, May 7, 1902, *Burnham 835* (G); Mount Pleasant, May 15, 1922, *Denslow* (NY); North Castle, May 23, 1923, *Denslow* (NY); vicinity of New Rochelle, 1908, *Garvens* (FM); woodland, North Tarrytown, May 9, 1915, *Pennell 2376* (NY). ROCKLAND CO.: Haverstraw, May 19, 1921, *Denslow* (NY); Ramapo, May 24, 1922, *Denslow* (NY); rocky woodland, Snedens Landing, Nov. 3, 1914, *Pennell 2334* (NY). BRONX CO.: Van Cortlandt Park, Caryl, Yonkers, May 11, 1893, *Bicknell 552* (NY); McLeans Woods, Bronx, May 13, 1913, *Holtzoff* (NY); Van Cortlandt Park, New York City, Apr. 29, 1921, *House 7726* (C); Bronx Park, New York City, May 11, 1896, *Nash 86* (NY). NEW YORK CO.: New York City, May 25, 1893, *ex herb. Curtis* (Minn); 54th St., New York City, May, 1848, *Leggett* (NY). SUFFOLK CO.: hilly rich woods, Cold Spring Harbor, May 23, 1928, *Ferguson 6529* (NY). NASSAU CO.: Roslyn, Sept. 12, 1919, *Ferguson* (NY); hilly rich woods, n. w. of Platsdale, July 17, 1926, *Ferguson 4160* (NY); hilly wet rich woods, Millneck, May 25, 1926, *Ferguson 4807* (NY). QUEENS CO.: Richmond Hill, May 11, 1904, *Bicknell* (NY); North Beach, May 16, 1927, *Ferguson 5410* (NY). ST. LAWRENCE CO.: rich woods, Canton, May 23, 1915, *Phelps 1384* (C, G, NY, US). ONEIDA CO.: ravine sides and rich woods, Utica, May 16, 1902, *Haberer 923* (G). ONONDAGA CO.: swamp, e. of Syracuse, *Bell* (US); near Syracuse, 1891, *Straub* (US). CHENANGO CO.: Bainbridge, Aug. 13, 1932, *Denslow* (NY). BROOME CO.: Binghamton, 1895, *Clute* (NY); rich woods, South Mt., Binghamton, *Millsbaugh 885* (FM). TOMPKINS CO.: leaf-mold on ledges, north side of

Fall Creek Ravine, above Beebe Lake, Ithaca, May 17, 1915, *Eames 3737* (G, Minn); woods, Fall Creek Ravine and vicinity, north shore of Beebe Lake, Ithaca, May 27, 1915, *Eames 3744* (FM, G); rich woods, n. w. of Enfield Falls, Enfield, June 11, 1917, *Gersboy 7884* (G); ravines, Ithaca, May, 1903, *Kauffman* (UM); flats near Lick Brook, Ithaca, May 23, 1920, *Muenschler & Bechtel 113* (WS); Six-mile Creek, Ithaca, May 26, 1883, *Pearce* (US). YATES CO.: without exact locality, *Sartwell* (FM). ONTARIO CO.: open woods, east side of Hemlock Lake, Canadice, May 18, 1915, *Thomas 3743* (G); moist woods, Geneva, June 4, 1882, *Wing* (M). LIVINGSTON CO.: glen, west side of Hemlock Lake, Conesus, May 20, 1915, *Thomas 3738* (G, M). COUNTY NOT DETERMINED: South Meadow, Adirondacks, Sept. 16, 1892, *ex herb. Clarke* (NY); Balsam Lake, Catskills, July, 1886, *Van Brunt* (NY).

NEW JERSEY. SUSSEX CO.: rich woods, Andover Junction, May 30, 1917, *Mackenzie 7642* (NY); wooded hillside, Sucker Pond, May 29, 1920, *Mackenzie* (NY); Franklin, Aug., 1879, *Rusby* (UM); woods, Hamburg, June 1, 1892, *ex herb. Van Sickle* (US). PASSAIC CO.: Butler, Sept. 22, 1922, May 14, 1923, *Denslow* (NY); woodlands, Greenwood Lake, May 19, 1907, *Mackenzie 2574* (M). BERGEN CO.: Fort Lee, May, 1898, *Wooton* (US). UNION CO.: Summit, July 30, 1868, *Leggett* (NY). SOMERSET CO.: Chimney Rock, May 21, 1932, *Drushel 7905* (M); dark moist woods along brook, Watchung, May 10, 1931, *Moldenke 1512* (NY). MIDDLESEX CO.: woodlands, Metuchen, May 18, 1919, *Mackenzie* (NY). MONMOUTH CO.: thickets, Cream Ridge, May 29, 1922, *Dreisbach 939* (FM); rich bottom woods, Freehold, Aug., 1917, *Mackenzie 7926* (NY); shaded marl slopes, Marlboro, Sept., 1917, *Mackenzie 8088* (NY); wooded marl banks, Marlboro, May 3, 1919, *Mackenzie* (NY). BURLINGTON CO.: wooded terraces along tributary, Rancocas Creek, 1 mi. n. e. of Pemberton, May 15, 1917, *Long* (WVU).

PENNSYLVANIA. BRADFORD CO.: woods, Athens, May 27, 1900, *Barbour 870* (RM). TIOGA CO.: Blossburg, Sept. 24, 1928, *Eggleston & Kelly 22766* (M, US). LYCOMING CO.: Deer Hole Mt., South Williamsport to summit, Sept. 21, 1928, *Eggleston & Kelly 22754* (US). MONROE CO.: Pocono Plateau, July, Aug., 1904, *Harsbberger* (FM, G, M, RM, US). NORTHAMPTON CO.: Easton, July 14, 1896, *Tyler* (NY). SCHUYLKILL CO.: Uhls Mill, Spring Mountain, May 2, 12, 1906, *Williamson* (NY). DELAWARE CO.: rocky woods, Rockdale, Sept. 6, 1914, *Pennell 1658* (NY); rich woods, Wawa, May 3, 1915, *Pennell 2368* (NY). LANCASTER CO.: Mountville, May, 1889, *Eby* (M); Cedar Hill, 3 mi. n. of Lancaster, Apr. 24, 1889, *Small* (FM). CUMBERLAND CO.: near Eberlys Mill, May 4, 1888, *Small* (FM). CLEARFIELD CO.: dry rich woods, 2 mi. n. w. of Du Bois, May 18, 1941, *Wahl 947* (WS). BLAIR CO.: Bellwood, May 18, 1904, *Jennings* (M photo). WESTMORELAND CO.: woodlands, hillside, Chestnut Ridge, May 19, 1935, *Bright 12426* (Minn); ravine, North Trafford, May 29, 1937, *Emig* (M). CRAWFORD CO.: Hartstown, May 31, 1937, *Emig* (M); edge of woods, Hemlock Island, 5 mi. w. s. w. of Linesville, May 19, 1932, *Graham* (NY).

DELAWARE. COUNTY NOT DETERMINED: woodlands, June, 1865, *Canby* (NYCP).

MARYLAND. GARRETT CO.: without locality, July 24, 1878, *Smith* (US).

WEST VIRGINIA. BROOKE CO.: Franklin Community, Wellsburg, June 6, 1937, *Emig* (M). OHIO CO.: shaded hillside, Middle Wheeling Creek, 6 mi. from mouth, July, 1937, *Bartholomew 345* (WVU); Oglebay Park, May 4, 1929, *Strausbaugh 46* (WVU); Hickory Hill, Wheeling, May 11, 1937, *West 157* (WVU). MARSHALL CO.: bank of Fish Creek near mouth of Lower Bowman Run, June 15, 1940, *Bartholomew 148* (WVU). MONONGALIA CO.: Morgantown, May 12, 1924, *Bourne 45* (WVU); rich woods, Falling Run, Morgantown, May 2, 1890, *Millsbaugh 75* (FM, NY, WVU); ½ mi. below Morgantown, May 16, 1937, *Myers* (WVU); Wadestown, *Thomas* (WVU). MARION CO.: College woods, May 9, 1937, *Beade* (WVU); near mouth of Pricketts Creek, May 16, 1937, *Harris* (WVU); rich shady moist woods, Rymer, May 15, 1937, *Thorn* (WVU). TAYLOR CO.: along Tygarts River, 2 mi. n. of Grafton, July 7, 1937, *Core 5501* (WVU). BARBOUR CO.: dry mixed woods, east bank of Tygart Valley River, near Tygart Junction, Sept. 24, 1904, *Moore 2564* (G, RM). UPSHUR CO.: Buckhannon, May 8, 1895, *Pollock* (M, US). PENDLETON CO.: 1 mi. n. of Mouth of Seneca, July 16, 1937, *Core 6150* (WVU); eastern spur of the main ridge of the Alleghany Mts., above Horton, Sept. 17, 1904, *Greenman 96* (G). RANDOLPH CO.: Pickens, Spring, 1938, *Perine* (WVU).

PLEASANTS CO.: near St. Marys, May 8, 1937, *Brooks & Margolin* (WVU). RITCHIE CO.: Mole Hill, Route 74, July 8, 1937, *Core 5611* (WVU); Cairo, Apr. 19, 1930, *Goodwin* (WVU). CALHOUN CO.: Pink, Apr. 22, 1933, *Harris* (WVU). KANAWHA CO.: rich shaded woods, around rock cliffs or old logs, Queen Shoals, Apr. 20, 1936, *Randolph 118* (WVU). CABELL CO.: near Lesage, May 1, 1937, *Brooks & Margolin* (WVU). FAYETTE CO.: near Glendale, May 1, 1937, *Brooks & Margolin* (WVU); Nuttallsburg, 1890, *Nuttall 46* (WVU). SUMMERS CO.: near Hinton, May 2, 1932, *Boone 60* (WVU); along stream, hollow of Hinton Mt., in horseshoe bend, May 4, 1939, *Tosh* (WVU). RALEIGH CO.: side of Baloff Mt., May 13, 1940, *Tosh 36* (WVU).

VIRGINIA. MADISON CO.: deep shade, s. and s. e. of Skyland, Shenandoah National Park, May 28, 1936, *Camp 1224* (NY). WYTHE CO.: shaded limestone bluffs, Wytheville, May 3, 1936, *Svenson 7767* (G). SMYTH CO.: Nicks Creek, vicinity of Marion, June 4, 1892, *Britton, Britton & Vail* (NY); Hungry Hollow, n. e. of Marion, May 24, 1892, *Small* (FM, M, MS); northeast slope of White Top Mt., May 28, 29, 1892, *Small* (FM); mouth of Hungry Mother Creek, July 4, 1892, *Small* (FM, G, NY, US); Middle Fork of Holston River, Marion, July 6, 1892, *Small* (FM, M, WS).

TENNESSEE. SEVIER CO.: Le Conte, July 4, 1929, *Hudson* (RM).

NORTH CAROLINA. BUNCOMBE CO.: moist soil among rocks, Craggy Mt., May 15, 1898, *ex herb. Biltmore 751a* (G, M, NY, US); thick woods, vicinity of Montreat, Aug. 24, 1913, *Standley & Bollman 9993* (US).

GEORGIA. FLOYD CO.: Rome, *Ravenel* (M).

MICHIGAN. HURON CO.: rich yellow birch woods at base of cliff above Lake Huron, s. e. of Huron City, July 1, 1937, *Anderson & Peck* (WS). MIDLAND CO.: marshy thicket, 2 mi. s. of Midland, May 30, 1927, *Dreisbach 4771* (UM). GRATIOT CO.: Alma, May 16, 1891, *Davis* (MS, UM); Alma, May 26, 1892, *Davis* (UM). ST. CLAIR CO.: open sandy woods near Lake Port, and moist woods near Jeddo, June 30, 1937, *Anderson & Peck* (WS); rich woods near Port Huron, June 5, Aug. 14, 1892, *Dodge* (UM); Port Huron, May, 1888, *ex herb. Glatfelter* (M). OAKLAND CO.: Rochester woods, June 15, 1913, *Farwell 3472* (Farwell); Rochester, May 17, 1914, *Farwell 3624* (Farwell); Parkdale Farm, June 13, 1915, *Farwell 3669* (Farwell, G, M, NY); Walled Lake woods, June 5, 1917, *Farwell 4487, 4489* (Farwell), *4490* (Farwell, G); moist woods, Rochester waterworks, May 15, 1918, *Farwell 4819* (Farwell, G); Marl Lake woods, Sept. 18, 1920, *Farwell 5697* (Farwell); low wet ground, borders of woods, Walled Lake, June 5, 1917, *Farwell & Chandler 4488* (Farwell TYPE of *P. boreale* var. *multiflorum* Farwell); Birmingham, May 25, 1913, *Sutton 292* (UM). WAYNE CO.: woods, Detroit, May 9, 1895, *Farwell 380c* (Farwell), *380d* (Farwell TYPE of *P. boreale* var. *australe* Farwell); Palmer Park woods, Detroit, May 31, 1915, *Farwell 3951* (Farwell), *3952* (Farwell, G, M, NY); Mill Road woods, Redford, May 23, 1920, *Farwell 5447, 5448* (Farwell, G), *5449* (Farwell); Livonia woods, May 21, 1929, *Farwell 8349* (Farwell); Detroit, June, 1870, *Footé* (UM). LIVINGSTON CO.: sandy soil, oak woods, Winants Lake, May 19, 1918, *Eblers 685* (UM). WASHTENAW CO.: Ann Arbor, May 12, 1860, *ex herb. Almendinger* (UM); third woods, s. e. of Ann Arbor, May 13, 1925, *Emerson* (UM); moist ravine in oak woods, n. of North Lake, May 27, 1925, *Erlanson 1613* (UM); woods near Ypsilanti, May 21, 1891, *Farwell 380b* (Farwell); third woods, near Ann Arbor, May 17, 1926, *Hermann 106* (UM); low elm-oak woods, 5 mi. s. e. of Ann Arbor, July 14, 1935, *Hermann 6892* (FM, MS); Ann Arbor, May 28, *Lewis 73* (UM); Cascade Glen, Ann Arbor, May 24, 1915, *Romein* (UM). INGHAM CO.: woods n. of Agricultural College, May 21, 1894, *Skeels* (MS). JACKSON CO.: without exact locality, May 13, 1897, *ex herb. Camp & Camp* (FM). HILLSDALE CO.: Hillsdale, May 29, 1885, *ex herb. Pelton* (UM). MASON CO.: oak dune, Hamlin Lake, Ludington, Aug. 10, 1910, *Chaney 63* (C, FM, US). MUSKEGON CO.: swamp, Lake Harbor, May 28, 1898, *Umbach* (FM, US). KENT CO.: low rich soil, Grand Rapids, June 1, 1893, *Cole* (Minn); Orchid Swamp, Grand Rapids, May 16, 1897, *Fyfe & Shaddick* (MS). OTTAWA CO.: Holland, Aug., 1910, *Kauffman* (UM). BARRY CO.: Gun Lake, May 30, 1891, *Bailey* (UM). VAN BUREN CO.: ravine, n. of South Haven, Sept. 4, 1911, *Lansing 3334* (FM, G); along river and on wooded hillsides, South Haven, July 18, 1910, *Pennington* (UM). CASS CO.: Hemlock Island, Magician Lake, Aug., 1905, *Pepoon* (MS). BERRIEN CO.: climax forest, Warren Woods,

July 26, 1919, *Billington* (MS, UM), July 30, 1919, *Billington* (UM). CHEBOYGAN CO.: cut-over beech and sugar maple woods, Grapevine Point, Douglas Lake, July 12, 1919, *Deam 28720* (D); same locality, July 19, 1921, *Eblers 1606* (UM); sandy soil, same locality, June 19, 1922, *Eblers 1945* (UM); Douglas Lake, July 20, 1911, *Gates 372* (MS); in pineland aspens, Biological Station, July 3, 1917, *Gates & Gates 10476* (M); Grapevine Point, Douglas Lake, July 9, 1929, *Hanna 177* (RM). EMMET CO.: in hardwoods, w. of Pellston, June 22, 1917, *Gates & Gates 10300* (FM, M, RM). CHARLEVOIX CO.: 4½ mi. n. w. of Vanderbilt, July 30, 1912, *Bessey* (MS). ANTRIM CO.: Bellaire, June 6, 1891, *Leavitt* (UM). ALGER CO.: rich deciduous woods above Miners Falls, near Munsing, July 2, 1934, *Fernald & Pease 3240* (G); Chatham, Aug. 22, 1900, *Wheeler* (MS). MARQUETTE CO.: *Acer saccharinum* forest, Turin, May 31, June 5, 1901, *Barlow* (C, G, NY, US), Aug. 21, 1901, *Barlow* (G, MS, US TYPE of *P. cuneatum* Greene); Negaunee, June, 1902, *Rydberg* (NY). KEWEENAW CO.: Cliff Mine woods, June 20, 1886, *Farwell 380, 380a*, Oct. 1, 1914, *Farwell 3909*, July 3, 1915, *Farwell 3995a, 3995b* (Farwell); rich maple woods, 1 mi. w. of Mandan, July 10, 1936, *Hermann 7917* (NY); hard maple woods, Lake Desor trail, Isle Royale, July 10, 1930, *McFarlin 2154* (UM). HOUGHTON CO.: mixed woods, Lake Linden incline, July 5, 1934, *Farwell 9893* (Farwell); Calumet waterworks, June 16, 1926, *Hermann 277* (UM); St. Louis Hill, July 2, 1926, *Hermann 456* (UM). ONTONAGON CO.: woods, south shore of Lake Superior, w. of Ontonagon, Aug., 1937, *Conard* (WS).

WISCONSIN. DOOR CO.: Ephraim, June 5, 1907, *Greenman 2167* (M); Ephraim, May 30, 1926, *Kraus et al.* (G). BROWN CO.: cedar swamp, Green Bay, May 18, 1878, *Schuetz* (FM); Upper Peninsula, Green Bay, June 14, 1889, *Schuetz* (FM). WASHINGTON CO.: Hartford, June 1, 1929, *Quandt* (WS). MILWAUKEE CO.: Milwaukee, *Hasse* (NY); river bank, Wauwatosa, June, 1890, *Strong* (UM). WALWORTH CO.: Delavan, May, 1866, *Milligan* (US). SAUK CO.: wooded bank, Parfreys Glen, Merrimac, May 23, 1926, *Fassett 3161* (G, NY). ONEIDA CO.: woods, Tomahawk Lake, Minocqua, Aug. 29, 1936, *Peck* (WS). CHIPPEWA CO.: woods, on red clay moraines, n. e. of Chippewa Falls, July 8, 1915, *Butters & Rosendahl 3093* (Minn).

MINNESOTA. COOK CO.: maple forest, Mineral Center, July 5, 1924, *Rosendahl & Butters 4592* (G, Minn, NY). BELTRAMI CO.: Cedar Island, Cass Lake, Aug. 2, 1914, *Pammel & Pammel 575* (G). CLEARWATER CO.: loam, fir and birch woods, Schoolcraft Island, Itasca Park, July 30, 1929, *Grant 2070* (G, Minn, US). HUBBARD CO.: *Populus tremuloides* forest, Benedict, Aug. 28, 1914, *Bergman 3123* (NY, Minn). OTTERTAIL CO.: wet wooded places, Little Pine Lake, Perham, May 30, 1910, *Chandonnet* (D); Lake Lida, Aug., 1892, *Sheldon 3760* (Minn). AITKIN CO.: Nichols, June, 1892, *Sheldon 2107* (Minn). MILLE LACS CO.: Mille Lacs Indian Reservation, June, 1892, *Sheldon 2532* (Minn). HENNEPIN CO.: rich woods, Minneapolis, May, 1892, *Burglehaus* (Minn); prairie, Fort Snelling Reservation, May 30, 1910, *Rosendahl 2462* (Minn). WINONA CO.: Winona, June 9, 1888, *Holzinger* (US TYPE of *P. boreale* Greene); wooded bluffs, without locality, May, 1904, *Holzinger* (Minn).

OHIO. PORTAGE CO.: Newell Ledge, June 16, 1901, *Webb 442* (G), May 10, 1903, *Webb 609* (G). SUMMIT CO.: Peninsula, May 11, 1895, *Moseley* (FM). CUYAHOGA CO.: bank in woods, Berea, June, 1895, *Ashcroft* (RM); Berea, May, 1896, May, 1897, *Ashcroft* (M); Wade Park, Cleveland, May 14, 1912, *Dreisbach 1039* (FM). LORAIN CO.: Oberlin, May 20, 1895, *Ricksecker* (US); rich moist woods, s. of Oberlin, May 21, 1892, *Strong* (UM). ERIE CO.: Cedar Point, May 19, 1893, *Moseley* (UM). OTTAWA CO.: Green Island, Aug. 20, 1940, *Myers* (WVU). RICHLAND CO.: rich damp soils, Mansfield, May 31, 1895, *Wilkinson 10454* (Minn). FRANKLIN CO.: rich wooded hillsides, n. of Columbus, May 13, 1905, *Gleason* (G). CHAMPAIGN CO.: without locality or date, *Samples* (UM). CLARK CO.: Springfield, *Williams* (M). BUTLER CO.: uplands and ravines, Hueston woods, near Oxford, July 9, 10, 1924, *Wehmeyer & Waters 86, 102* (UM).

INDIANA. STEUBEN CO.: low tamarack border of Graveyard Lake, ½ mi. from n. e. corner of state, May 25, 1920, *Deam 30417* (D); black and white oak slope, e. side of Pokagon State Park, May 26, 1927, *Deam 44289A* (D); tamarack bog, ¼ mi. e. of Poka-

gon State Park, May 24, 1929, *Deam 46578* (D). LAGRANGE CO.: Sarah Long woods, along Pigeon River, 2 mi. w. of Mongo, May 17, 1915, *Deam 15702* (D); dry woods, 1½ mi. n. w. of Stroh, June 5, 1915, *Deam 15948, 15957* (D); moist woods, 1½ mi. s. e. of Mongo, May 27, 1920, *Deam 30453* (D). DE KALB CO.: rich damp woods, 1 mi. s. of Garrett, May 17, 1908, *Deam 3034* (D); beech and sugar maple woods, 1 mi. s. of St. Joe, Aug. 17, 1916, *Deam 20849* (D); moist ground in beech and sugar maple woods, ½ mi. s. of St. Joe, May 25, 1920, *Deam 30383* (D); white oak ridge, 2 mi. s. e. of Hamilton, May 25, 1927, *Deam 44279* (D); Truelove woods, 3 mi. e. of Avilla, May 9, 1930, *Deam 48181* (D). NOBLE CO.: woods, 6 mi. s. w. of Rome City, June 20, 1910, *Deam 6780* (D); white oak woods, 4 mi. n. w. of Kendallville, June 6, 1915, *Deam 15848* (D). ALLEN CO.: white oak woods, ½ mi. s. of Viberg Lake, May 31, 1915, *Deam 15826* (Minn); moist woods, 4 mi. e. of Fort Wayne, May 31, 1915, *Deam 15832* (D, Minn). WHITLEY CO.: woods, 2½ mi. s. w. of Coesse, July 5, 1920, *Deam 31181* (D). ADAMS CO.: moist place, woods, 1 mi. w. of Ohio line, 5 mi. s. of Allen Co. line, Aug. 31, 1920, *Deam 32594* (D); rich moist woods of beech, elm and white oak, 3 mi. n. of New Corydon, May 13, 1921, *Deam 33814* (D). WELLS CO.: rich woods, near Bluffton, May 16, 1897, *Deam* (D, FM); rich woods, May 12, 1901, *Deam* (Minn, NY); woods, S. 30, Harrison Tp., May 14, 1905, *Deam* (M, US); Pearce woods, 1½ mi. n. w. of Craigville, Aug. 27, 1924, *Deam 40969* (D). HUNTINGTON CO.: moist woods, 2 mi. n. e. of Buckeye, May 26, 1907, *Deam 1946* (D, Minn); Colvin woods, 1½ mi. e. of Mt. Etna, May 8, 1934, *Deam 54781* (Minn). JAY CO.: beech woods, ¾ mi. n. of Bryant, May 18, 1916, *Deam 19733* (D); Cring woods, 2 mi. n. e. of Portland, July 19, 1923, *Deam 39130* (D); woods, S. 24, 2 mi. n. e. of Pennville, June 8, 1932, *Deam 52044* (D). BLACKFORD CO.: woods, S. 21, 4 mi. n. w. of Hartford City, June 5, 1932, *Deam 51974* (D). RANDOLPH CO.: woods, s. e. of Unionport, May 16, 1916, *Deam 19678* (D); beech woods, 5 mi. n. e. of Lynn, May 16, 1916, *Deam 19693* (D). DELAWARE CO.: woods, 5 mi. w. of Eaton, May 25, 1917, *Deam 23128* (D); same locality, May 27, 1921, *Deam 34086* (D). FAYETTE CO.: beech and sugar maple woods, 1 mi. s. e. of Alpine, May 17, 1921, *Deam 33059* (D); beech woods, 1 mi. n. e. of Orange, May 18, 1921, *Deam 34042* (D). RUSH CO.: woods, 1 mi. w. of Gowdy, May 1, 1922, *Deam 35340* (D); level rich woods, 2 mi. w. of Gowdy, July 7, 1925, *Deam 41395* (D). FRANKLIN CO.: Hillenbrand woods, 2 mi. n. w. of Hamburg, July 20, 1922, *Deam 36935* (D). RIPLEY CO.: woods, 1 mi. s. w. of Versailles, May 3, 1922, *Deam 35372* (D). JENNINGS CO.: beech-liquidambar-red maple woods, 7 mi. s. of Vernon, May 14, 1918, *Deam 24745* (D); red gum-red maple woods on the Frank Hite farm, 4 mi. s. e. of Vernon, Aug. 5, 1932, *Deam 52548* (D). OHIO CO.: wooded slope, along Laughery Creek, S. 5, 1½ mi. s. w. of Farmers Retreat, May 24, 1924, *Deam 40342* (D); wooded slope, along Laughery Creek, 3 mi. w. of Milton, May 9, 1929, *Deam 46567* (D); high wooded bluff, along Laughery Creek, S. 5, 3 mi. s. of Farmers Retreat, May 8, 1931, *Deam 40998* (D). ELKHART CO.: woods, 12 mi. n. w. of Goshen, May 11, 1916, *Deam 19576* (D); woods, 3 mi. s. of Middlebury, May 14, 1919, *Deam 27455* (D, G); black and white oak woods, 3 mi. s. w. of Middlebury, May 27, 1927, *Deam 44321* (D). ST. JOSEPH CO.: beech-white oak woods, 8 mi. w. of South Bend, May 10, 1916, *Deam 19540* (D); woods, 1¼ mi. s. e. of North Liberty, May 5, 1921, *Deam 33711* (D). KOSCIUSKO CO.: Plummer woods, 4½ mi. n. w. of Leesburg, May 14, 1923, *Deam 38271* (D); woods, 7 mi. n. e. of North Manchester, May 18, 1933, *Deam 53607* (D). MARSHALL CO.: woods, s. w. of Lake Maxinkuckee, May 20, 1901, *Clark 1676* (US); n. of Lapaz Junction, May 8, 1913, *Nieuwland 11035* (M). WABASH CO.: white oak, beech and sugar maple woods, 3 mi. n. e. of Disko, May 3, 1921, *Deam 33643* (D). MIAMI CO.: woods, 1 mi. e. of Deeds-ville, June 8, 1920, *Deam 31081* (D); low beech woods, Larison farm, 2½ mi. s. w. of Amboy, May 26, 1922, *Deam 36199* (D). CASS CO.: rich moist woods, 2½ mi. w. of Lucerne, June 9, 1931, *Deam 50242* (D). GRANT CO.: Leonard woods, 5 mi. n. w. of Upland, May 22, 1915, *Deam 15801* (D); Smith woods, 9 mi. e. of Marion, May 23, 1916, *Deam 19799* (D). HOWARD CO.: rich wooded bank of Wildcat Creek, 2 mi. w. of Greentown, May 15, 1910, *Deam 5947* (D). HAMILTON CO.: wooded hillside, e. of Carmel, May 11, 1913, *Deam 12677* (D). HANCOCK CO.: moist rich woods, 1½ mi. s. e. of Julietta, May 14, 1912, *Deam 10509* (D). MARION CO.: Decatur Tp., April 30,

1905, *Deam* (D). JACKSON CO.: rich beech woods, 1 mi. n. of Chestnut Ridge, April 25, 1910, *Deam* 5658 (D); wooded slope, Guthrie Creek, 6 mi. n. of Medora, May 15, 1918, *Deam* 24778 (D); wooded ravine, 2 mi. s. e. of Leesville, May 19, 1922, *Deam* 35751 (D). WASHINGTON CO.: with beech, base of wooded slope, 6 mi. s. e. of Pekin, S. 24, May 11, 1931, *Deam* 50018 (D). LA PORTE CO.: wooded sand dunes, w. of Michigan City, May 22, 1910, *Deam* 6427 (D); wooded dunes, e. of Michigan City, May 28, 1913, *Deam* 13046 (D); tamarack swamp, ½ mi. n. of Mill Creek, June 4, 1920, *Deam* 30750 (D). CARROLL CO.: sugar maple woods, 1½ mi. s. w. of Burnettsville, May 20, 1923, *Deam* 38314 (D); beech and sugar maple woods, 1½ mi. w. of Camden, Aug. 17, 1925, *Deam* 42136 (D); wooded ravine, 5 mi. n. of Delphi, May 11, 1930, *Deam* 48238 (D). TIPPECANOE CO.: in ravines and on hillsides, along river road, La Fayette, May 5, 1900, *Dorner* (D). MONTGOMERY CO.: deep wooded ravines, Sugar Creek, near The Shades, May 16, 1913, *Deam* 12779 (D). PUTNAM CO.: woods at alluvial end of lateral ravine, D. P. U. arboretum, Greencastle, May 5, 1935, *Dawson* 1136 (Minn); wooded bank, Raccoon Creek, near McGaughey's, June 29, 1913, *Deam* 13479 (D); Nelson woods, 10 mi. n. w. of Greencastle, May 23, 1922, *Deam* 35974 (D); moist slope in woods, Knoll farm, S. 13, 4 mi. s. e. of Putnamville, May 17, 1926, *Deam* 42782 (D). MORGAN CO.: near Monroe Co. line, Monroe-Morgan State Forest, 6 mi. s. of Martinsville, May 22, 1930, *Deam* 48364 (D). OWEN CO.: with beech, woods, 3 mi. n. e. of Quincy, May 22, 1922, *Deam* 35906 (D). MONROE CO.: beech slope, 3 mi. n. w. of Harrodsburg, May 21, 1931, *Deam* 50167 (D); Fee pasture, ½ mi. n. e. of Bloomington, 1908, *Pickett* (WS). LAWRENCE CO.: base of hemlock bluff, Back Creek, 2 mi. n. w. of Leesville, May 25, 1930, *Deam* 48441 (D). CRAWFORD CO.: wooded base of Evergreen Bluff, 4 mi. s. w. of Grantsburg, June 8, 1919, *Deam* 27792 (D, G.) PORTER CO.: Doran woods, 5 mi. s. w. of Lake Michigan, July 10, 1920, *Deam* 31487 (D); moist ground, north side of Doran woods, 4 mi. s. w. of Michigan City, May 23, 1923, *Deam* 38454 (D). FOUNTAIN CO.: moist woods, 2 mi. n. of Hillsboro, May 24, 1922, *Deam* 36037 (D). PARKE CO.: wooded ravine, Sugar Creek, near Turkey Run, Sept. 2, 1911, *Deam* 9917 (D). CLAY CO.: wooded bank of creek, 1 mi. e. of Harmony, May 4, 1914, *Deam* 12644 (D).

ILLINOIS. COOK CO.: damp woods, Forest Glen, June 4, 1892, *Harper* (WS); woods, near Chicago, June 4, 1892, *ex herb. Moffatt* 86 (Minn).

2. *Polygonatum cobrense* (Wooton & Standley) Gates in Bull. Torr. Bot. Club 44:126, *pl. 6*, B. 1917.

Salomonina cobrensis Wooton & Standley in Contrib. U. S. Nat. Herb. 16:113. 1913.

Perennial herb, 2 to 4 dm. high; rhizome slender; stem slender, somewhat flexuous, glabrous; leaves 10 to 12, alternate, more or less secund, elliptic, 4 to 9.5 cm. long, 0.9 to 3.2 cm. broad, obtuse or slightly acute, narrowed at the base to a broad petiole 3 to 4 mm. long, glabrous, glaucous beneath, very faintly nerved, only the midrib prominent; cauline bract papery, easily detached; peduncles strongly and sharply deflexed, flattened, glabrous, 8 to 15 mm. long, 1- or 2-flowered; pedicels 4 to 16 mm. long, glabrous, sometimes flattened; floral bracts white, papery, narrow, 3 to 6 mm. long, caducous; flowers fragrant, ivory-white, lobes and veins greenish; perianth of mature flower 17 to 23 mm. long, 7 mm. broad, tubular, somewhat expanded toward the mouth, the lobes erect, oblong, obtuse, nearly as long as the tube (about 7 mm. long); filaments slightly papillose, inserted near the middle of the tube; immature fruit pyriform, up to 8 mm. in diameter.

Polygonatum cobrense is easily distinguished from the other North American species. From *P. biflorum* and *P. commutatum* it differs in its papery, caducous

cauline bract and strongly deflexed peduncles. In these characters it resembles *P. pubescens*, from which it differs in its glabrous leaves, large flowers, slightly expanded cylindrical perianth tube, with the filaments inserted near the middle. It is very similar in appearance to the type species of the genus, the European *P. officinale*, and is possibly more closely related to this than to any North American species. Greene must have realized this relationship when he labelled some of his specimens from the Pinos Altos Mountains and Gila Canyon "*Polygonatum vulgare* Desf." [= *P. officinale* All.]—"New to America."

Specimens of *Polygonatum cobrense* were probably the basis for the inclusion of New Mexico and Arizona within the range of *Polygonatum commutatum* as given by Britton & Brown's 'Illustrated Flora' and others.

DISTRIBUTION: Sandy soil on north- and east-facing slopes, or in shade, mountains of Sierra and Grant counties, New Mexico, to southern Navajo County, Arizona.

NEW MEXICO. SIERRA CO.: shady places near Kingston, 1904, *Metcalfe 1036* (US). GRANT CO.: Copper Mines, Santa Rita, June, *Bigelow* (NY, US TYPE); Pinos Altos Mts., May 21, 1880, *Greene 92* (G, M, NYCP); Gila Canyon, April, 1881, *Greene* (FM, G); shady loam, Mimbres River, south end of Black Range, 5500 ft. alt., July 1, 1904, *Metcalfe 1036* (FM, G, M, Minn, NY, US); sandy, usually rocky soil on north- and east-facing slopes or in shade, Canyon of Sapillo Creek, T. 4 or 5 S., R. 14 W., Gila National Forest, June 17, 1938, *Ownbey & Ownbey 1643* (WS, to be distributed); grown at Pullman, Washington, from rhizomes of *Ownbey & Ownbey 1643*, June 10, 1944, *Ownbey* (WS, to be distributed); Copper Mines, 1851, *Wright 1917* (G, NY, US).

ARIZONA. NAVAJO CO.: Ft. Apache, 1893, *Hoyt* (NY).

3. *Polygonatum biflorum* (Walter) Elliott, Sketch Bot. S. C. & Ga. 1:393. 1817.

Convallaria biflora Walter, Fl. Car., p. 122. 1788.

Polygonatum multiflorum γ . *biflora* Wood, Class-book of Bot., ed. 1, p. 396. 1845.

Salomonina biflora Farwell in Rept. Comm. Parks, Detroit 11:53. 1900.

Polygonatum angustifolium Pursh, Fl. Am. Sept. 1:234. 1814.

Convallaria angustifolia Sprengel, Syst. Veg. 2:96. 1825.

Convallaria canaliculata Mühlenberg in Willdenow, Hort. Berol. 1:45. 1806.

Polygonatum canaliculatum Pursh, Fl. Am. Sept. 1:234. 1814.

Polygonatum multiflorum δ . *canaliculata* Wood, Class-book of Bot., ed. 1, p. 396. 1845.

? *Convallaria parviflora* Poiret in Lamarck, Encyc. Méth. Bot. Suppl. 4:29. 1816.

? *Polygonatum parviflorum* A. Dietrich in Otto & Dietrich, Allg. Gartenz. 3:222. 1835.

Polygonatum multiflorum β . *americanum* Hooker, Fl. Bor. Am. 2:176. 1839, probably in part.

Polygonatum biflorum var. *hebetifolium* Gates in Bull. Torr. Bot. Club 44:121. 1917, as to description mostly, and as to specimens cited except the type specimen *ex herb. Chapman* (pl. 5, A), and the specimen from Watson, Missouri, which is *P. commutatum*.

Polygonatum hebetifolium Bush in Am. Midl. Nat. 10:391. 1927, excluding name-bringing synonym.

Perennial herb up to about 6 dm. high; rhizome slender; stem slender, erect or arching, upper leafy part usually shorter than lower naked part; leaves alternate, sometimes secund, sessile to semiamplexicaul, elliptic-lanceolate, 4 to 11 cm. long, 0.9 to 3 cm. broad, the upper ones not much shorter than the lower ones, glabrous, paler and glaucous beneath, with 1 to 9 (usually 1 to 5) longitudinal nerves, only

the middle one prominent the entire length of the leaf, the others discernible but often hardly raised and usually fading out in the upper part of the leaf; cauline bract green, leaf-like, persistent; peduncles axillary, solitary, slender, glabrous, arcuate, 1- or 2 (rarely 3)-flowered; pedicels slender, glabrous, subequal, usually shorter than the peduncle; flowers whitish; perianth of mature flower 11 to 19 (usually 13 to 15) mm. long, 3 or 4 mm. broad in pressed material, cylindrical; perianth lobes 3 or 4 mm. long, scarcely spreading; filaments usually minutely papillose, inserted near the middle of the tube.

The type specimen of Walter's *Convallaria biflora* is preserved in the British Museum of Natural History. Dr. J. Ramsbottom, Keeper of Botany, has kindly sent a photograph of this specimen, accompanied by the following note by Mr. J. E. Dandy, Assistant Keeper:

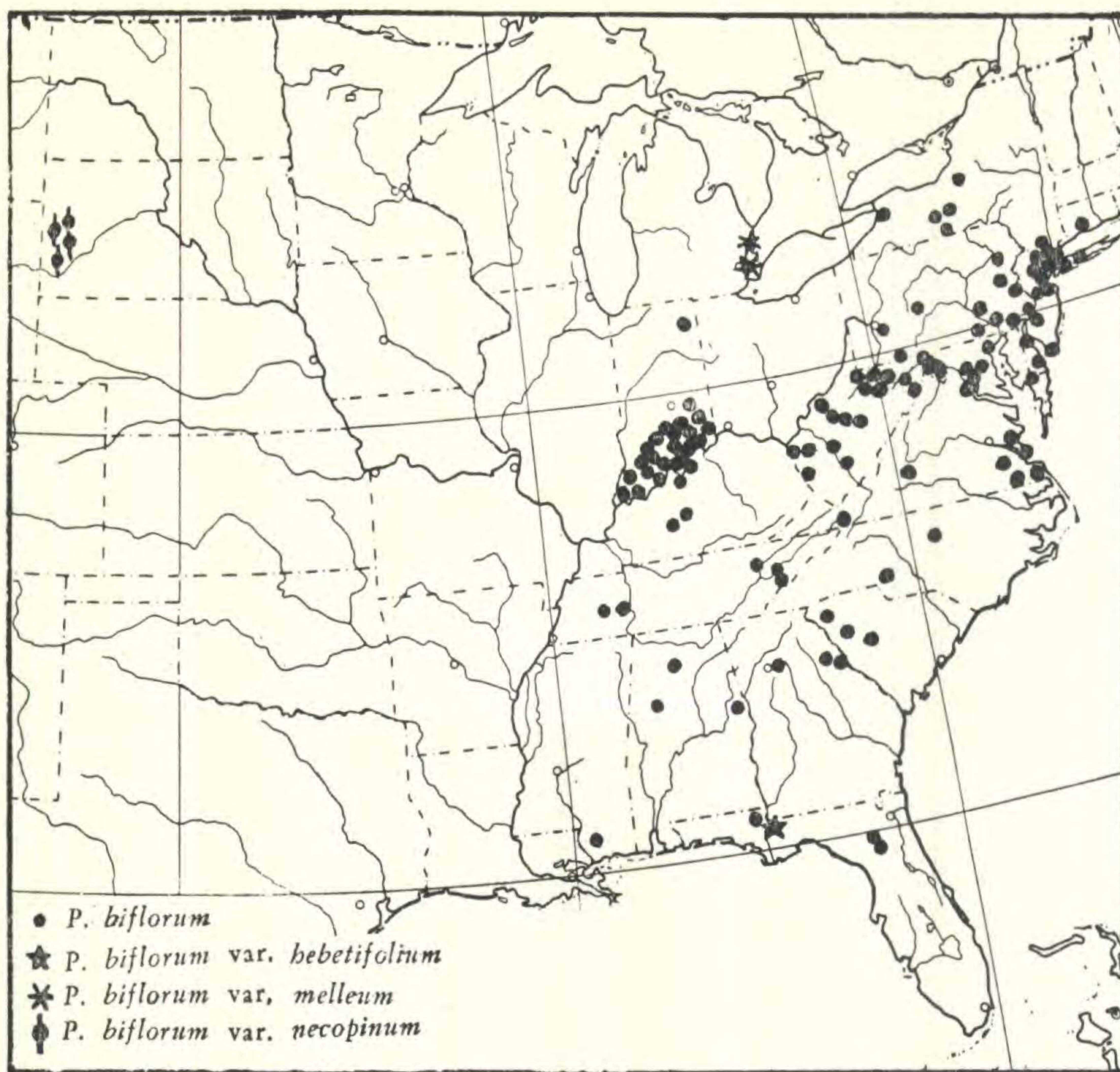
"The specimen is smooth and glabrous throughout (stem, leaves and peduncles). The leaves have dried brown, but the lower surface (as can be seen from the photo.) is paler and slightly glaucescent.

"The specimen agrees with Walter's description except that the leaves are not markedly trinerved. Flowers are absent, but they may have become broken off and lost. It is preserved on fol. 35 of Walter's Herbarium."

It is unfortunate that Gates did not see this specimen, for he misinterpreted Walter's species, considering the very narrow-leaved plants from the Chapman Herbarium (see *P. biflorum* var. *hebetifolium*) as typical. The specimens of the broader-leaved true *biflorum* which he saw, he included in his var. *hebetifolium*. It is because of this misinterpretation that Bush used the name *P. hebetifolium*, raising Gates' variety to specific rank, although the specimens he cited are probably all good *P. biflorum*.

As here interpreted, *Polygonatum biflorum* and its varieties compose the diploid element ($n = 10$) of the glabrous *P. biflorum*-*P. commutatum* complex of eastern North America. When all of the varieties of *P. biflorum* are considered together, the diploid element of the complex is indeed difficult to distinguish from the tetraploid element, *P. commutatum* ($n = 20$), except by chromosome number. In general, however, the diploids are smaller in size, daintier in texture, and have fewer and smaller flowers (except var. *hebetifolium*), and fewer prominent leaf nerves (except var. *melleum*); the upper leafy portion of the stem is usually shorter than or equal to the lower naked portion in length (except in var. *necopinum*). All members of the *P. biflorum*-*P. commutatum* complex are separated from the other two species in North America by the green, leaf-like, persistent cauline bract and by the arcuate, not strongly deflexed, peduncles.

The diploids are woodland plants and show little tendency to invade open places, roadsides, fence rows and alluvial soils. Geographically, *Polygonatum biflorum* is less widely distributed than the tetraploid species, and each of its three varieties is highly restricted in range. The present distributions of these four entities suggest that they are all remnants of a once widespread diploid. *P. biflorum* var. *melleum* is found in a small area in Michigan and Ontario, south of Lake Huron, and outside the range of *P. biflorum*. *P. biflorum* var. *hebetifolium* is known from only one locality in western Florida, within a small area which is



Map 2. Distribution of *Polygonatum biflorum* and its varieties. Based on Goode Base Map No. 102. By permission of The University of Chicago Press.

already famous for its other endemics, notably *Torreya taxifolia* and *Taxus floridana*. *P. biflorum* var. *necopinum* is restricted to the Black Hills of South Dakota, a region interesting because it is an outpost of the ranges of a number of species of plants, both eastern and western. *P. biflorum* itself, though found over a fairly wide area in eastern United States, also is limited in range. For the most part it is found south of the Wisconsin glacial drift. In Indiana, where the edge of that glaciation is well defined, the species lies wholly south of the boundary, except for a single collection from Allen County. Farther east, the layer of glacial drift is thinner, the boundary is less definite, and some collections from New York, Pennsylvania and Connecticut are apparently within the area of the Wisconsin glaciation.

DISTRIBUTION: Usually in sandy soil, moist to dry woods, Connecticut and New York, south to Florida, west to Indiana, Kentucky, Tennessee and Mississippi (Map 2).

CONNECTICUT. NEW HAVEN CO.: open ledges, top of West Rock, New Haven, June 24, 1932, *Eames 11429* (G).

NEW YORK. ORANGE CO.: Shunemunk Mt., near Mountainville, July 31, 1922, *Denslow* (NY). ROCKLAND CO.: Ramapo, May 24, 1922, *Denslow* (NY). WESTCHESTER

co.: near Bryn Mawr, May 21, 1893, *Bicknell 555* (NY); Larchmont, May, 1891, *Clarke* (NY). NEW YORK CO.: "woods opp. Fire Engine House," New York, June 30, 1894, *Bicknell 557* (NY); Cactus Knoll, New York City, June 22, 1899, *Clute* (NY). SUFFOLK CO.: hilly rich woods, n. of Motor Parkway, Wyandanch, June 2, 1925, *Ferguson 3762, 3763* (NY); hilly dry oak woods, Northport, May 21, 1927, *Ferguson 5447* (NY); dry hilly woods, Smithtown, June 9, 1927, *Ferguson 5572* (NY); dry hilly woods, Cold Spring Harbor, Aug. 31, 1926, *Ferguson 6013* (NY). NASSAU CO.: woods, Merrick, May 27, 1921, *Ferguson 127* (NY); rich wet woods, Meadowbrook, June 10, 1925, *Ferguson 3786* (NY); edge of plains, East Meadowbrook, s. of Westbury and Hicksville, June 20, 1927, *Ferguson 5652, 5653* (NY); hilly rich woods, Locust Valley, June 7, 1928, *Ferguson 6590* (NY). QUEENS CO.: high hilly woods, Queens, May 30, 1913, *Bicknell 558* (NY); Flushing, May 29, 1925, *Ferguson 3744* (NY). RICHMOND CO.: Princes Bay, Staten Island, May 25, 1889, *Britton* (NY). ONONDAGA CO.: Onondaga Valley, June, 1890, *Underwood* (NY). TOMPKINS CO.: shore of Beebe Lake, Fall Creek Ravine and vicinity, Ithaca, May 27, 1915, *Alexander 3745* (G); cemetery, Ithaca, June 8, 1892, *Durand* (Minn); Fall Creek, June 9, 1893, *Schrenk* (M); dry ravine bank, between Renwick and McKinney's, Ithaca, June 18, 1916, *Wiegand 6198* (G). SCHUYLER CO.: dry oak-cornel hillside, e. of Montour Falls, Montour, Sept. 23, 1917, *Wiegand 7886* (M). CHEMUNG CO.: rich woods, without locality, June 3, 1896, *Lucy 2642* (FM). ERIE CO.: Buffalo, *Clinton* (G). COUNTY NOT DETERMINED: South Harbor, June 9, 1895, *Howell* (M).

NEW JERSEY. BERGEN CO.: moist woods, Carlstadt, 1877, *Oehler* (NYCP). PASSAIC CO.: Boardville, Pompton, May 31, 1923, *Denslow* (NY); railroad embankment, near Hewitt, Sept. 17, 1923, *Denslow* (NY); Haskell, Pompton, June 6, 1927, *Denslow* (NY). MORRIS CO.: woods, Chatham, May 30, 1903, *Mackenzie 189* (NY); dry woodlands, Budd Lake, June 9, 1918, *Mackenzie 8321* (NY). HUDSON CO.: Snake Hill, near Hoboken, June 2, 1884, *Schrenk* (M). UNION CO.: Plainfield, June 12, 1892, *Morong* (NY); Summit, June, *Slosson* (WS). MIDDLESEX CO.: New Brunswick, May, 1894, *Blodgett* (NY); sandhills, Woodbridge, May 30, 1890, *Churchill* (G); New Brunswick, June, 1888, *Vail* (NY). MONMOUTH CO.: Freehold, June 2, 1854, *Walters* (UM). MERCER CO.: Pennington Mt., Hopewell, June 17, 1924, *Denslow* (NY). CAMDEN CO.: rich thicket, e. of North Branch of Newton Creek at A. C. R. R., West Collingswood, May 22, 1926, *Adams 190* (M); thickets, Gloucester, May 30, 1922, *Dreibach 2-83* (FM); roadside, Albion, June 7, 1926, *Meredith* (NY). GLOUCESTER CO.: sandy fields and fence rows near the lighthouse, Washington Park, May 24, 1910, *Long 3509* (G). CAPE MAY CO.: moist sandy woods, Cape May Point, June 3, 1928, *Benner* (G).

PENNSYLVANIA. MONROE CO.: Naomi Pines, Pocono Plateau, June 7-10, 1889, *Britton* (NY). LEHIGH CO.: woods, 1 $\frac{1}{8}$ mi. w. by s. w. of Wescosville, May 8, 1921, *Pretz 10665* (NY). BUCKS CO.: woods, 2 mi. n. w. of Doylestown, May 31, 1925, *Dreibach 3497* (UM); West Rockhill Tp., near Telford, June 13, 1926, *Strohm* (G). MONTGOMERY CO.: Bryn Mawr, May, 1887, *Southworth* (UM). PHILADELPHIA CO.: woods, East Fairmount Park, Philadelphia, May 17, 1877, *Redfield 8186* (M). CHESTER CO.: West Chester, 1827, *Darlington* (NY); woods, Westtown Farm, May 24, 1905, *Wildman 172* (US). LANCASTER CO.: Mountville, July, 1888, *Eby* (M); limestone, on the Little Conestoga Creek beyond Millersville, May 31, 1901, *Heller* (FM, G, US); limestone, woods below Graeffs Landing, Sept. 14, 1901, *Heller* (US); woods and thickets, Mountalto, June 6, 1906, 1908, *Illick* (M). DAUPHIN CO.: woods, near Steelton, July 18, 1888, *Small* (FM). YORK CO.: Conewago Creek, May, 1898, *Eisenhower* (M); without locality, June 3, 1895, *Glatfelter* (M); without locality, June 3, 1895, *Williams* (M). BLAIR CO.: Rattlesnake Mt., Tyrone, Aug. 20, 1915, *Anderson* (G). WESTMORELAND CO.: Shades Ravine, North Trafford, May 29, 1937, *Emig* (M). FAYETTE CO.: woodlands, Ohiopyle, May 23, 1936, *Bright 13652* (WS).

DELAWARE. NEW CASTLE CO.: woods, Townsend, May, 1890, *Canby* (Minn); Brandywine River, Wilmington, May 10, 1886, *Leeds* (FM). SUSSEX CO.: dry sandy soil, without locality, Sept. 8, 1887, *Canby* (NY).

MARYLAND. WICOMICO CO.: sandy woods, Salisbury, Aug., 1889, *ex herb. Canby* (NYCP). BALTIMORE CO.: without locality, May 23, 1878, *Smith* (US). ALLEGANY

co.: Cumberland, 1894, *Shriver* (NY). MONTGOMERY CO.: rich rocky woods, near Widewater, below Greatfalls, May 10, 1916, *Kearney & Maxon 77* (US); Cabin John Run, May 18, 1897, *Pieters* (UM); Glen Echo, May 19, 1895, *Pollard 261* (US); damp woods, opposite Plummers Island, May 9, 1915, *Standley 11410* (US); Plummers Island, in the Potomac River, near Cabin John, May 9, 1915, *Standley 11473* (US). PRINCE GEORGES CO.: Laurel, June 3, 1897, *Knowlton* (US); low woods at edge of swamp, e. of Sunnyside, June 7, 1918, *Maxon 6420* (US).

DISTRICT OF COLUMBIA. Woods, Chevy Chase road, near Reno, May 25, 1904, *Chase 2222* (FM, MS); in woods n. of Military Road, Rock Creek Park, May 25, 1915, *Maxon & Standley 143* (US); Rock Creek Park, May 14, 1896, *Steele* (US); low ground, May 10, 1897, *Steele* (Minn); Piney Branch, May 9, 1895, *Topping* (Minn); Rock Creek, May 15, 1872, June 16, 1878, *Ward* (US); vicinity of Washington, Aug. 20, 1876, *Ward* (US).

VIRGINIA. ARLINGTON CO.: Clarendon, May 25, 1928, *Blake 10576* (WS); Fort Myer, May 14, 1896, *Mearns* (US). GLOUCESTER CO.: vicinity of Capahosic, May 26, 1914, *Van Eseltine 141* (US). JAMES CITY CO.: rich soil of beech slope, 1/2 mi. w. of Williamsburg, May 11, 1920, *Grimes 2577* (NY); deep wooded ravine, 2 mi. s. e. of Williamsburg, Apr. 21, 1921, *Grimes 3472* (NY); rich wooded hillside, 1 mi. s. e. of Williamsburg, May 2, 1921, *Grimes 3529* (G, NY). ELIZABETH CITY CO.: damp thicket, Hampton, May 7, 1903, *Miller* (US). PRINCESS ANNE CO.: rich woods, Great Neck, May 5, 1935, *Fernald & Griscom 4356* (G); rich deciduous woods, e. of Little Creek, July 31, 1934, *Fernald & Long 3857* (G); dry mixed woods, Little Neck, Aug. 8, 9, 1934, *Fernald & Long 3858* (G); recently cleared sandy knoll, Virginia Beach, May 9, 1903, *Miller* (US). NORFOLK CO.: near Norfolk, May 21, 1898, *Kearney 1310* (US). SOUTHAMPTON CO.: sandy alluvial bottomlands of Three Creek, Drewryville, June 22, 23, 1936, *Fernald, Long & Smart 5718* (G). SUSSEX CO.: sandy and loamy woods, s. of Pleasant Grove Church, July 22, 1936, *Fernald & Long 6157, 6158* (G). BEDFORD CO.: dry woods, without locality, May 10, 1871, *Curtiss* (G). SMYTH CO.: vicinity of Marion, May 19, 1892, *Britton, Britton & Vail* (NY); slopes and summit of Pond Mt., East Marion, June 11, 1892, *Small* (FM).

WEST VIRGINIA. BERKELEY CO.: Camp Frame, May 16, 1937, *Shreve* (WVU). MORGAN CO.: summit of Cacapon Mt., July 9, 1937, *Core 5783* (WVU). HAMPSHIRE CO.: Hanging Rock, May 26, 31, June 15, 28, 1932, *Frye 605, 540, 492, 1062a* (WVU). MINERAL CO.: Ridgeville, May 31, 1940, *Southern Appalachian Botanical Club Foray* (WVU). PRESTON CO.: Lake Terra Alta, June 6, 1937, *Tighe, Conrad & Bergner* (WVU). MONONGALIA CO.: Morgantown, May 31, 1926, *Humphrey 788* (WVU). TAYLOR CO.: Wendel, May 29, 1940, *Davis & Davis 3970* (WVU). HARRISON CO.: Shinnston, July 29, 1933, *Martin 216* (WVU). WETZEL CO.: woods, between Hundred and Littleton, June 9, 1931, *Haught 349* (WVU). BRAXTON CO.: Little Birch, June 1, 1933, *Harris* (WVU). CALHOUN CO.: Sycamore, June 1, 1933, *Harris* (WVU). WIRT CO.: 1 mi. above mouth of Reedy Creek, June 23, 1934, *Bartholomew 94* (WVU). WOOD CO.: Parkersburg, July 19, 1929, *W. V. U. Botanical Expedition* (G). KANAWHA CO.: Gilligans Hill, May 30, Watts Hill, Aug. 9, 1934, *Greenlee* (WVU). LINCOLN CO.: forest above Miller School, July 1, 1930, *Berkley 907* (M). WAYNE CO.: 1 mi. n. of Ft. Gay, Nov. 22, 1931, *Lycan 13* (WVU). MINGO CO.: Kermit, June 3, 1933, *Harris* (WVU). RALEIGH CO.: along hollow, up Madams Creek, May 27, 1940, *Tosh 118* (WVU).

NORTH CAROLINA. ORANGE CO.: vicinity of Chapel Hill, May, 1898, *Ashe* (NY). MECKLENBURG CO.: dry woods, Charlotte, Apr. 26, 1924, *Knowlton* (G).

SOUTH CAROLINA. ANDERSON CO.: Watson woods, near Anderson, May 10, 1920, *Davis 5102, 7021* (M), *7698* (UM); Norris farm, near Anderson, Aug. 7, 1919, *Davis 9871* (M); dry oak woods, 6 mi. n. of Anderson, Aug. 20, 1927, *Wiegand & Manning 804* (G). GREENWOOD CO.: Greenwood, Aug. 24, *Davis* (M). LEXINGTON CO.: vicinity of Batesburg, Apr. 29, 1911, *McGregor 22* (US).

GEORGIA. RICHMOND CO.: clay soil, ravine, Augusta, Apr. 25, 1903, *Cuthbert* (UF); ravine, Raes Creek, Augusta, Apr. 29, June 6, 1904, *Cuthbert* (UF). MCDUFFIE CO.: wooded hillside near branch, vicinity of Thomson, Sept. 8, 1907, *Bartlett 986* (UM),

Aug. 9, 1909, *Bartlett 1713* (D). DE KALB CO.: Stone Mt., May 1-18, 1895, *Small* (NY).

FLORIDA. ALACHUA CO.: Buzzards Roost, Gainesville, May 3, 1936, *Arnold & West* (UF); same locality, May 2, 1928, *West* (UF). MARION CO.: McIntosh, Apr. 8, 1926, *Miller 532* (US). JACKSON CO.: hammock along Blue Springs, n. of Marianna, Mar. 17, 1937, *Exploration Party 1937* (UF); Chipola River, Marianna, July 20, 1936, *Hume* (UF).

ALABAMA. CULLMAN CO.: Cullman, Aug. 25, 1891, *Mohr* (US). TUSCALOOSA CO.: Tuscaloosa, Apr. 4, 1874, *ex herb. Mohr* (US); Tuscaloosa, Apr. 10, 1874, *Smith* (US). LEE CO.: Auburn, Apr. 17, 1897, *Earle & Baker* (NY); Auburn, Apr. 22, 1896, *Earle & Underwood* (NY).

MISSISSIPPI. HANCOCK CO.: Crane Creek, Apr. 3, 1918, *Johnson* (Farwell).

INDIANA. ALLEN CO.: wooded ravine, Robinson Park, 6 mi. n. e. of Ft. Wayne, June 3, 1906, *Deam 1054* (D). FAYETTE CO.: beech-sugar maple woods, 1 mi. s. e. of Alpine, May 16, 1921, *Deam 33939* (D). FRANKLIN CO.: Bane woods, 1½ mi. s. w. of Metamora, May 17, 1921, *Deam 33995* (D); Hillebrand woods, 2 mi. s. w. of Metamora, July 21, 1922, *Deam 36954* (D). DEARBORN CO.: beech-white oak woods, 3½ mi. s. e. of Sunman, May 19, 1919, *Deam 27561* (D); white oak-beech woods, 1 mi. s. w. of Farmers Retreat, May 24, 1924, *Deam 40352* (D). JENNINGS CO.: white oak woods, 2 mi. e. of Grayford, May 30, 1923, *Deam 38594* (D); woods, 3 mi. s. w. of Scipio, May 9, 1924, *Deam 40087* (D). JEFFERSON CO.: low flat woods, 2½ mi. n. e. of Kent, May 30, 1930, *Deam 48573* (D). SCOTT CO.: beech-sugar maple woods, 1 mi. n. of Lexington, May 20, 1919, *Deam 27585* (D, Farwell, G); beech woods, 1½ mi. n. of Lexington, May 5, 1922, *Deam 35422, 35439* (D); beech woods, along Kinberlin Creek, 4 mi. w. of Lexington, May 12, 1924, *Deam 40117* (D); beech slope, low woods of Chas. Shields, 1½ mi. w. of Lexington, May 15, 1927, *Deam 44241* (D). CLARK CO.: deep wooded ravine, just n. of tract 15, Clark Co. State Forest, May 11, 1910, *Deam 5864* (D); white oak woods, without locality, May 25, 1919, *Deam 27603* (Farwell). BARTHOLOMEW CO.: beech woods, 6 mi. n. w. of Columbus, June 5, 1921, *Deam 264* (D). BROWN CO.: woods, between Helmsburg and Nashville, May 21, 1910, *Deam 5983* (D); beech slope, 1 mi. w. of Georgetown [Bean Blossom], May 22, 1930, *Deam 48381* (D); white oak slope, 2 mi. e. of Helmsburg, May 22, 1930, *Deam 48386* (D). JACKSON CO.: wooded slope, south side of Guthrie Creek, 6 mi. n. of Medora, May 15, 1918, *Deam 24773* (D). WASHINGTON CO.: woods, Wright farm, 5 mi. s. e. of Salem, May 20, 1924, *Deam 40240* (D). HARRISON CO.: woods, 5 mi. s. e. of Milltown, June 25, 1915, *Deam 16434* (D); woods, 2 mi. n. e. of Corydon, June 3, 1917, *Deam 23384* (D); rich woods, 2½ mi. s. e. of Palmyra, June 4, 1917, *Deam 23424* (D); wooded slopes, Elizabeth, June 11, 1919, *Deam 27887* (Farwell); wooded slope of Elizabeth Hill, 3 mi. e. of Elizabeth, May 10, 1922, *Deam 35516* (D). MONROE CO.: beech woods, ¾ mi. n. w. of Harrodsburg, June 9, 1917, *Deam 23573* (D); woods, ½ mi. w. of Stanford, Aug. 8, 1918, *Deam 26072A* (D); wooded ravine, 11 mi. n. e. of Bloomington, May 21, 1922, *Deam 35851* (D); wooded sandstone slope, 3 mi. s. of Stanford, May 21, 1931, *Deam 50173* (D). GREENE CO.: sandy soil, sugar maple woods, 1 mi. n. of Newberry, July 3, 1918, *Deam 25659* (D). LAWRENCE CO.: woods, Donaldson farm, 3 mi. s. e. of Mitchell, July 12, 1915, June 8, 1917, *Deam 17282, 23525* (D); woods along Guthrie Creek, 1¼ mi. n. e. of Tunnelton, May 17, 1918, *Deam 24844* (D). MARTIN CO.: wooded cliff of White River, 2 mi. above Shoals, May 20, 1913, *Deam 12875* (D); wooded hillside, 2 mi. n. e. of Loogootee, July 10, 1915, *Deam 17140* (D). DAVIESS CO.: beech-white oak woods, 1 mi. n. e. of Portersville, June 11, 1929, *Deam 46831* (D); black and white oak ridge, 2 mi. n. e. of Corning, May 18, 1931, *Deam 50120* (D). ORANGE CO.: with beech, wooded slope, Meissen woods, 6 mi. s. e. of Paoli, May 14, 1922, *Deam 35652, 35668* (D). DUBOIS CO.: dry woods, 3½ mi. s. w. of Huntingburg, May 4, 1919, *Deam 27234* (D, Farwell); moist white oak woods, 3 mi. s. w. of Huntingburg, May 4, 1919, *Deam 27239* (D); crest of black and white oak woods, 2 mi. e. of Holland, May 29, 1926, *Deam 43050* (D). PERRY CO.: black and white oak woods, 7 mi. n. e. of Tell City, May 3, 1927, *Deam 44179* (D); with beech, base of a black and white oak slope, 6 mi. up Deer Creek from its mouth, May 6, 1929, *Deam 46546* (D); dry wooded slope, 5 mi. n. w. of Rome, Aug. 10, 1931, *Deam 50908* (D). WARRICK CO.: woods, 1½ mi. e. of New-

burg, June 11, 1918, *Deam* 25335 (D). GIBSON CO.: Mauck woods, 4 mi. s. e. of Princeton, June 30, 1918, *Deam* 25532 (D). POSEY CO.: very sandy woods, Dransfield farm, 3 mi. s. of New Harmony, Sept. 27, 1926, *Deam* 43841 (D).

KENTUCKY. JEFFERSON CO.: Louisville, 1835, *Short* (M). MEADE CO.: damp hillside by brook, Grahampton, near Fort Knox, Apr. 30, 1933, *Carleton* 245 (G). EDMONSON CO.: moist ravine, Chalybeate, May 8, 1936, *Shacklette* 309 (G). WARREN CO.: Bowling Green, May 29, 1899, *Price* (M).

TENNESSEE. KNOX CO.: rich wooded bluffs, Knoxville, June, 1897, *Ruth* 1172 (NY). BLOUNT CO.: Sunshine, June 5, 1929, *Hudson* 173 (RM). ROANE CO.: Oliver Springs, May 3, 1890, *Lamson-Scribner* (US). DECATUR CO.: without locality, May, 1855, *ex herb. Ames* (UM). MADISON CO.: rich woods, Jackson, May, 1892, *Bain* 307 (NY).

STATE NOT DETERMINED. Photograph of TYPE in the British Museum Herbarium (M).

3a. *Polygonatum biflorum* var. *melleum* (Farwell) R. Ownbey, n. comb.

Polygonatum melleum Farwell in Rept. Mich. Acad. Sci. 20:170. 1918.

Perennial herb, usually less than 6 dm. high; rhizome slender; stem slender, arching, upper leafy part usually about equalling lower naked part in length; leaves alternate, elliptic-lanceolate to short-elliptic, sessile to distinctly short-petiolate, 2.5 to 16 cm. long, 1 to 8.5 cm. broad, glabrous, dark green above, glaucous and paler beneath, with 5 to 11 nerves all of nearly equal prominence and all fading out above the middle of the leaf; cauline bract green, leaf-like, persistent; peduncles axillary, solitary, flattened, glabrous, arcuate, 2- to 4-flowered; pedicels unequal, equal to or shorter than the peduncle; flowers honey-yellow, 12 to 15 mm. long; filaments somewhat papillose to densely so, inserted near the middle of the perianth tube; immature berries up to 8 mm. in diameter.

Polygonatum biflorum var. *melleum* differs from *P. biflorum* in having many-nerved leaves, more and smaller flowers, and very nearly equal upper leafy and lower naked portions of the stem. The type specimen and plants like it may easily be distinguished also by the strikingly short and elliptic leaves, 2.1 to 2.5 times as long as broad, as opposed to 2.9 to 3.6 times in *P. biflorum*, and by a great difference in length between the lower and upper leaves of the same plant; in *P. biflorum* the lower leaves are usually 1.1 to 1.5 times as long as the upper ones; in typical var. *melleum* they are 2.1 to 2.4 times as long. A mass collection from the type locality of *P. biflorum* var. *melleum*, statistically studied, reveals, however, that this variety is extremely variable. Some individuals are indistinguishable from *P. biflorum*, while others are difficult or impossible to separate, on morphological criteria, from *P. commutatum*. Thus it cannot be considered to be a species.

DISTRIBUTION: Restricted to the region about Lake St. Clair, south of Lake Huron, in Michigan and Ontario (Map 2). At the type locality, at least, it is found on the beach of an ancient glacial lake.

MICHIGAN. ST. CLAIR CO.: open woods, glacial lake beach, near Algonac, June 30, 1937, *Anderson & Peck* (mass collection); open woods, Algonac, June 16, 1915, *Farwell* 3974 (Farwell TYPE); Algonac, Sept. 15, 1900, *Dodge* (UM).

ONTARIO. ESSEX CO.: Sandwich, July 25, 1901, *Macoun* 54099 (MS).

3b. *Polygonatum biflorum* var. *hebetifolium* Gates in Bull. Torr. Bot. Club 44:121, pl. 5, A. 1917, as to specimen cited as the type.

Polygonatum hebetifolium Bush in Am. Midl. Nat. 10:391. 1927, as to name-bringing synonym only.

Polygonatum biflorum sensu Gates in Bull. Torr. Bot. Club 44:120, pl. 4, B. 1917.

Perennial herb; stem simple, 4 to 5 dm. high, glabrous; leaves alternate, subsecund, semiamplexicaul, oblong-lanceolate, 5 to 9 times as long as broad, 6.5 to 13 cm. long, 0.8 to 2 cm. broad, the upper ones nearly as long as the lower ones, glabrous, with from 3 to 7 nerves of which only the middle one extends the full length of the leaf; cauline bract green, leaf-like, persistent; peduncles axillary, solitary, 12 to 35 mm. long, slender, glabrous, arcuate, 1- or 2-flowered; pedicels subequal, 3 to 15 mm. long, shorter than the peduncles, glabrous; flowers large, 20 to 23 mm. long, yellowish when dry; filaments minutely papillose, the free part shorter than the anthers.

Polygonatum biflorum var. *hebetifolium* is quite distinct from *P. biflorum* because of the long narrow leaves, 5 to 9 times as long as broad, the long slender flexuous peduncles, and the large flowers. It belongs, without question, to the *P. biflorum*-*P. commutatum* complex. Its morphological characteristics suggest that it is diploid, and as such it must be considered to be a variety of *P. biflorum*. The stomates, however, are even larger than is usual in the tetraploid *P. commutatum*. If it should be found to be tetraploid also, it must stand as a third species of this complex, taking the name *P. hebetifolium*. Attempts to secure living material for cytological study were unsuccessful. Mr. Leslie Hubricht looked for plants in its only known locality, and reported the native vegetation largely destroyed by wild pigs.

The only specimens of this variety known to the writer are several sheets from Chapman's herbarium in the Herbarium of the Missouri Botanical Garden. The one chosen by Gates as the type specimen has immature flowers and lacks data as to name of collector and place and time of collection. The other specimens include two sheets of plants collected in rich shady woods at Aspalaga, Florida, April, 1898, and a set of six sheets of very uniform specimens lacking collection data. These six are cited by Gates as typical of his conception of Walter's *Convallaria biflora*. Another sheet contains one specimen like those on the six sheets mentioned and one specimen with slightly broader leaves. This last plant Gates mentions in his discussion of the variety. All the other specimens cited by Gates with the original description are *P. biflorum*, except the plant from Watson, Missouri (*Bush* 527), which is *P. commutatum*. It is unfortunate that Gates selected one of the Chapman specimens to typify his variety *hebetifolium* when he referred the rest of them to *P. biflorum*. It is quite obvious that his intention was to separate the broad-leaved plants (true *C. biflora* Walter) as the variety, and it is to this broad-leaved element that the descriptive name "*hebetifolium*" (blunt-leaved) refers. Only the specimen which was designated as the type ties the inappropriate varietal name *hebetifolium* to the narrow-leaved entity.

Gates, for no apparent reason, except that Walter originally described *Convallaria biflora* in his 'Flora Caroliniana', states that the Chapman plants "doubtless came from somewhere in the southeastern states, probably North Carolina."

It seems much more likely that they were collected in western Florida, where Chapman lived, especially since two sheets in the group are so labelled.

DISTRIBUTION. Rich shady woods. Known from only one locality, along the Apalachicola River at Aspalaga, western Florida (Map 2).

FLORIDA. LIBERTY CO.: rich shady woods, Aspalaga, Apr., 1898, *ex herb. Chapman* (M). COUNTY NOT DETERMINED: without locality or date, *ex herb. Chapman* (M 138701 TYPE); without locality or date, *ex herb. Chapman* (M).

3c. *Polygonatum biflorum* var. *necopinum* R. Ownbey, n. var.⁴²

Perennial herb about 6 dm. high; rhizome slender; stem slender, nearly erect, upper leafy part longer than lower naked part; leaves alternate, short-petiolate, elliptic-lanceolate, 6.5 to 10 cm. long, 1.8 to 4 cm. broad, glabrous, paler and glaucous beneath, with 1 to 7 longitudinal nerves, only the midrib prominent the full length of the leaf; cauline bract green, leaf-like, persistent; peduncles axillary, solitary, slender, flattened, glabrous, arcuate, 2-flowered; pedicels slender, glabrous, subequal, shorter than the peduncle; flowers whitish, 15 to 17 mm. long, 5 or 6 mm. broad in pressed material, cylindrical, perianth lobes 4 mm. long, scarcely spreading; filaments nearly smooth, inserted near the middle of the tube.

Polygonatum biflorum var. *necopinum* is taller and has flowers a little larger than is usual in *P. biflorum*, and the upper leafy portion of the stem is considerably longer than the lower naked portion. Its habitat is on limestone rather than in sandy soil. Geographically it is found far outside the range of *P. biflorum*. Except for its diploid chromosome number it is very much like many plants of the tetraploid *P. commutatum*.

DISTRIBUTION. On limestone, deciduous woods along streams, foothills canyons of the Black Hills of western South Dakota (Map 2).

SOUTH DAKOTA. MEADE CO.: Black Hills, near Ft. Meade, July 27, 28, 1887, *Forwood* 348 (C, US). LAWRENCE CO.: Lead City, July 16, 1892, *Rydberg* 1039 (US). PENNINGTON CO.: Rapid Creek and Dark canyons, Rapid City, June 13, 1927, *Hayward* 821 (FM, RM); grown from rhizomes collected in Rapid Creek Canyon, 1 to 3 miles above Canyon Lake, moist shady slope under oaks and elms, limestone formation, June, 1939, *Ownbey & Ownbey* (M TYPE, WS). CUSTER CO.: in shade, along stream, State Game Lodge, June 26, 1924, *McIntosh* 408 (RM).

4. *Polygonatum commutatum* (Schultes f.) A. Dietrich in Otto & Dietrich, *Allg. Gartenz.* 3:223. 1835.

Convallaria commutata J. H. Schultes in Schultes & Schultes, *Syst. Veg.* 7²:1671. 1830.

Polygonatum latifolium var. *commutatum* Baker in *Journ. Linn. Soc. [Lond.] Bot.* 14:555. 1875.

Polygonatum biflorum var. *commutatum* Morong in *Bull. Torr. Bot. Club* 20:480. 1893; *Mem. Torr. Bot. Club* 5:115. 1894.

⁴² *Polygonatum biflorum* var. *necopinum*, var. nov. Herba perennis ad 6 dm. alta; radice subtenui; cauli subtenui prope erecto, parte superiori foliosa quam parte inferiori nuda longiori; foliis alternis brevi-petiolatis elliptico-lanceolatis, 6.5–10 cm. longis, 1.8–4 cm. latis, glabris, subtus pallidioribus glaucisque, 1–7-nerviis, medio-nervo solo prominente per totam longitudinem foliorum; bractea caulina viridi foliacea persistente; pedunculis axillaribus solitariis tenuibus compressis glabris arcuatis bifloris; pedicellis tenuibus glabris subaequalibus quam pedunculo brevioribus; floribus subalbidis, 15–17 mm. longis, 5 vel 6 mm. latis, cylindricis, laciniis 4 mm. longis leviter patentibus; filamentis subglabris, prope tubi medium insertis.

- Salomonina commutata* Farwell in Rept. Comm. Parks, Detroit 11:53. 1900.
Polygonatum latifolium Pursh, Fl. Am. Sept. 1:235. 1814, not *P. latifolium* (Jacq.) Desf. in Ann. Mus. Par. 9:50. 1807.
Polygonatum multiflorum ϵ . *latifolia* Wood, Class-book of Bot., ed. 2, p. 553. 1847.
Polygonatum giganteum A. Dietrich in Otto & Dietrich, Allg. Gartenz. 3:222. 1835.
Convallaria gigantea Hort. ex Dietrich, l. c., as synonym.
Polygonatum multiflorum γ . *giganteum* Wood, Class-book of Bot. Fl. U. S. & Can., p. 714. 1861.
Polygonatum canaliculatum β . *giganteum* Miquel in Ann. Mus. Bot. Lugduno-Batavi 3:148. 1867.
Polygonatum biflorum β . *giganteum* Wood, Am. Bot. and Flor., p. 346. 1870.
Polygonatum canaliculatum var. *giganteum* Farwell in Bull. Torr. Bot. Club 42:256, pl. 18. 1915; Am. Midl. Nat. 11:78. 1928.
Polygonatum multiflorum β . *americanum* Hooker, Fl. Bor. Am. 2:176. 1839, probably in part.
Polygonatum canaliculatum var. *americanum* Farwell in Bull. Torr. Bot. Club 42:256, pl. 17, B. 1915; Am. Midl. Nat. 11:77. 1928.
Polygonatum virginicum Greene, Leaflets 1:181. 1906.
Polygonatum biflorum virginicum Farwell in Bull. Torr. Bot. Club 42:254, pl. 15, B. 1915.
Polygonatum commutatum virginicum Gates in Bull. Torr. Bot. Club 44:123, pl. 6, A. 1917.
Polygonatum biflorum var. *ovatum* Farwell in Bull. Torr. Bot. Club 42:255, pl. 16, A. 1915.
Polygonatum commutatum ovatum Gates in Bull. Torr. Bot. Club 44:124. 1917.
Polygonatum ovatum Bush in Am. Midl. Nat. 10:397. 1927.
Polygonatum canaliculatum var. *ovatum* Palmer & Steyermark in Ann. Mo. Bot. Gard. 22:503. 1935.
Polygonatum ellipticum Farwell in Bull. Torr. Bot. Club 42:255, pl. 16, B. 1915.
Polygonatum commutatum var. *lineamentosum* Lunell in Am. Midl. Nat. 5:94. 1917.
Polygonatum canaliculatum var. *americanum* subvar. *ellipticum* Farwell in Am. Midl. Nat. 11:78. 1928.
Polygonatum canaliculatum var. *oblongifolium* Farwell in Rept. Mich. Acad. Sci. 22:181. 1921.
Polygonatum commutatum f. *ramosum* McGivney in Am. Midl. Nat. 9:664. 1925.
Polygonatum canaliculatum f. *ramosum* Clute in Am. Bot. 49:73. 1943.
Polygonatum biflorum f. *ramosum* Fernald in Rhodora 46:12. 1944.
Polygonatum biflorum var. *ovatum* subvar. *ellipsoidale* Farwell in Am. Midl. Nat. 11:78. 1928.

Perennial herb, 0.5 to 2 m. high, rarely smaller; rhizome stout, often branched; stem usually stout, arching, upper leafy part longer than lower naked part; leaves 11 to 25, alternate, amplexicaul, varied in shape, ovate-lanceolate, elliptic-lanceolate, oblong-lanceolate, or broadly oval, 6 to 18 cm. long, 1.5 to 10 cm. broad, glabrous, dark green above, glaucous and paler beneath, with 7 to 19, or more, major nerves, prominent the full length of the leaf, often so strong that the leaf is grooved on the upper surface, the major nerves alternating with other fainter, but distinct, nerves; cauline bract green, leaf-like, persistent; peduncles coarse, flattened, often stiff and wiry, usually long and arched, glabrous, 1- to 15-flowered; pedicels subequal to sometimes very unequal, usually shorter, but sometimes longer, than the peduncle; flowers yellowish green to greenish white, tipped with green, 14 to 23 mm. long, 3 to 7 mm. broad, perianth lobes more or less spreading; filaments smooth to densely papillose, inserted near the middle of the perianth tube; berries dark blue, 8 to 12 mm. in diameter.

Polygonatum commutatum represents the tetraploid element of the *P. biflorum*-*P. commutatum* complex. Although known under the name *P. commutatum* for nearly a century, this species has in recent years been passing under the name *P. canaliculatum*. During the early part of this work the latter name was mistakenly applied to this tetraploid element by the present writer. Since nearly all of the herbarium study was done at this time, specimens of *P. commutatum* in many herbaria were annotated as *P. canaliculatum*. A re-examination of the original description of *P. canaliculatum*, however, does not reveal a single character which will identify this description with the tetraploid species rather than with the diploid. The writer is now convinced that *P. canaliculatum* is completely synonymous with *P. biflorum*. It is hoped that anyone making use of her annotations will understand that specimens called "*P. canaliculatum*" are to be considered to be *P. commutatum*.

Although chromosome number is the only completely constant character which separates the two species of the complex, *P. commutatum* is usually distinguished by the greater vigor which often accompanies tetraploidy. These so-called *gigas* characters include a general robustness, a stouter stem, a larger number of leaves and flowers, broader and thicker leaves, coarser peduncles, larger flowers and fruits. *P. commutatum* usually differs from *P. biflorum* in its many-nerved leaves and in having the upper leafy portion of the stem longer than the lower naked portion. The former character occurs in *P. biflorum* var. *melleum*; the latter, in *P. biflorum* var. *necopinum*.

Geographically, *P. commutatum* is found not only over most of the area occupied by *P. biflorum*, but extends in nearly every direction beyond the range of the diploid species. As has previously been pointed out, the present distributions of *P. biflorum* and its varieties suggest that an ancestral diploid once extended at least as far west as the Black Hills of South Dakota. The several areas intervening between the remnants of this diploid have now largely been occupied by the more aggressive tetraploid.

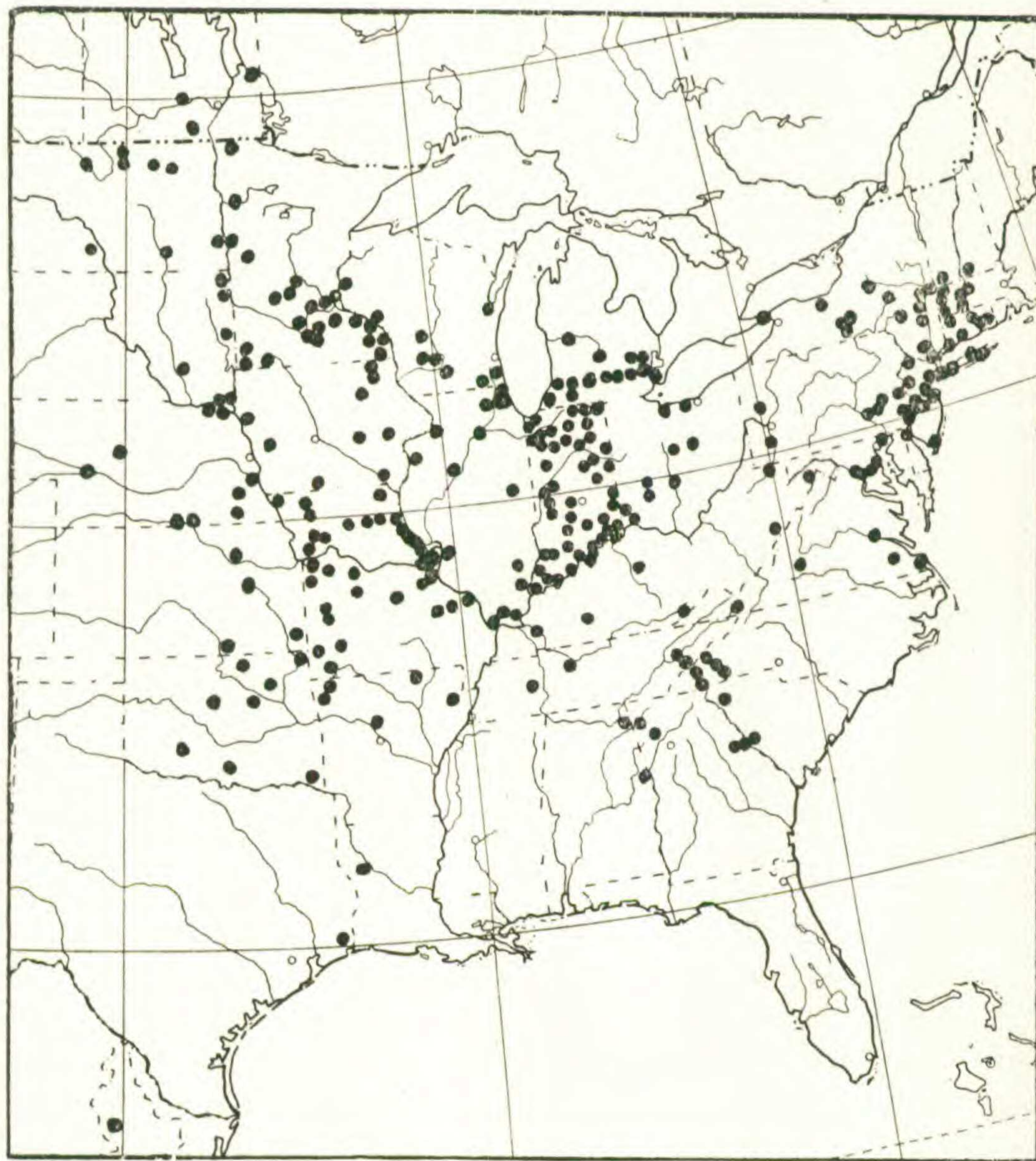
In unusually favorable habitats, in alluvial soils, along roadsides, and when cultivated, *P. commutatum* often reaches great size. It is this ecological type which Fernald⁴³ in his recent paper separated as the species, disregarding the fact that complete morphological intergradation exists between this extreme and the smaller, more slender ecotype of less favorable situations. The only certain way to distinguish small *biflorum*-like plants of *P. commutatum* growing within the distributional range of *P. biflorum* is by chromosome number. As explained in the section on cytology (page 377), there is no reliable way to estimate chromosome number in *Polygonatum* from herbarium sheets. Such fairly well-correlated characters as general vigor, size of leaves, number of flowers, and stomatal size and distribution, although very useful in this instance, fail to give a complete separation between the diploid and the tetraploid. It is therefore to be expected that the following list of exsiccatae will contain undetected diploids. Especially in the coastal region from New York to Virginia,

⁴³Fernald, M. L. Specific distinctions between *Polygonatum biflorum* and *P. canaliculatum*. *Rhodora* 46:9-12. 1944.

in the mountains of North and South Carolina and Georgia, in Indiana and southern Michigan, the writer found plants which resembled *P. biflorum* except for their large size. Most of these questionable specimens were omitted from the citations of either species, although in most cases the specimens were annotated. It is hoped that the number of errors in citation and annotation will be small.

DISTRIBUTION. In sandy, calcareous, or alluvial soils, woods and open places; generally distributed throughout eastern North America from New Hampshire and Massachusetts, south to Georgia, west to the 102nd meridian from southern Manitoba to northeastern Mexico (Map 3).

ONTARIO. LINCOLN CO.: dry soil, Dimming farm, near Niagara, June 16, 1884, *Macoun* (C). WELLAND CO.: Point Abino, Lake Erie, Aug. 28, 1896, A. A. A. S. *Excursion* (NY); damp ravines, near Stamford, June 12, 1891, *Macoun* (C). ESSEX CO.: Walkerville, June 9, 1891, *Johnson 10455* (Farwell); rich damp woods, Amherstburg, June 11, 1882, *Macoun* (C).



Map 3. Distribution of *Polygonatum commutatum*. Since the map was made, additional specimens from West Virginia, Indiana and Oklahoma have been seen. Based on Goode *Base Map* No. 102. By permission of The University of Chicago Press.

MANITOBA. ST. CLEMENTS DIST.: "Riviere Winipeg," July 14, 1857, *Bourgeau* (G). LAKESIDE DIST.: rich woods, Portage la Prairie, June 10, 1879, *Macoun* (C). MORDEN AND RHINELAND DIST.: by a brook, Morden, Aug. 4, 1896, *Macoun* (C).

NEW HAMPSHIRE. CHESHIRE CO.: Hinsdale, Aug. 2, 1902, *Blanchard 80* (NY), 116 (G).

VERMONT. BENNINGTON CO.: bank of Hoosic River, Pownal, May 30, 31, 1900, *Eggleston 2102* (G).

MASSACHUSETTS. HAMPSHIRE CO.: Southampton, *ex herb. Chapman* (M); bogs, Amherst, July 15, 1875, *Morong* (NY). HAMPDEN CO.: border of woods, slopes above the Connecticut River, Holyoke, Sept. 7, 1926, *Seymour 602* (G, M, NY). BERKSHIRE CO.: Williamstown, June 29, 1901, *Churchill* (G); alluvial riverbank, Sheffield, June 12, 1919, *Churchill* (M); bank of Housatonic River, Stockbridge, June 9, 1912, *Kennedy* (G).

CONNECTICUT. NEW LONDON CO.: railroad grade, Franklin, July 25, 1911, *Woodward* (G). HARTFORD CO.: fence rows, Southington, June 29, 1898, *Andrews 348* (G); dry border of field, Glastonbury, June 10, 1932, *Denslow* (NY); East Hartford, 1900, *Driggs* (G). MIDDLESEX CO.: Chatham, July 5, 1924, *Beals & Chamberlain* (NY). NEW HAVEN CO.: rich soil in copse, Milford, May 31, 1896, *Eames* (US); New Haven, June 5, 1884, *Safford* (US). LITCHFIELD CO.: Canaan, June 10, 1912, *Kennedy* (G). FAIRFIELD CO.: Stratford, July 23, 1871, *ex herb. Day* (NYCP); Fairfield, May 20, 1894, *Eames* (US); shrubby roadside on coast, Westport, Sept. 5, 1928, *Eames 10779* (G); vicinity of Greens Farms, June 7, 1894, *Pollard 41* (US).

NEW YORK. RENSSELAER CO.: Troy, 1828-1834, *Hall* (FM). ALBANY CO.: low moist woods, Wemple, Aug. 4, 1933, *House 20625* (NY). GREENE CO.: Hotaling Island, Hudson River, New Baltimore, Aug. 19, 1909, *Taylor 1395* (NY). DELAWARE CO.: Arkville, July 18, 1915, *Wilson* (NY). ULSTER CO.: Saugerties, May 28, 29, 1910, *Taylor 1904* (NY). ORANGE CO.: Goshen, July 10, 1922, *Denslow* (NY); Tuxedo, June 12, 1892, *Morong* (NY); West Point, May 30, 1906, *Umbach* (NY). ROCKLAND CO.: Piermont, June 2, 1888, *Stabler* (G). BRONX CO.: McLeans Woods, Bronx, May 13, 1913, *Holtzoff* (NY); Bronx Park, May 25, 1896, *Nash 140* (NY). SUFFOLK CO.: Orient, *ex herb. Farlow* (G); East Hampton, Oct. 16, 1919, *Ferguson A-1, A-2* (NY); hilly dry woods, Kings Park, Sept. 8, 1926, *Ferguson 6055, 6056* (NY); openings in oak woods, Roanoke Point, Oct. 4, 1936, *Svenson 8252* (G); copses, Northville, June, 1873, *Young* (FM). NASSAU CO.: Woodmere, June 11, 1916, *Bicknell 560* (NY); dry level oak woods, Seaford, June 11, 1927, *Ferguson 5606* (NY); dry oak woods, south edge of Hempstead Plains, East Meadowbrook, June 20, July 29, 1927, *Ferguson 5650, 5940-a, 5940-c* (NY); Inwood, June 10, 1888, *Poggenburg* (NY). QUEENS CO.: Queens, May 30, 1913, *Bicknell 558a* (NY); Springfield, Aug. 4, 1919, *Ferguson* (NY); Rosedale, July 27, 1926, *Ferguson 5049* (NY); College Point, Sept., 1879, *Schrenk* (NY). RICHMOND CO.: Giffords, Staten Island, May 19, 1889, *Britton* (NY); Staten Island, June, 1868, *ex herb. Crooke* (NY). OTSEGO CO.: alluvial soil, open woods, banks of Cattaraugus Creek, Colliers, July 24, 1927, *Johnson* (NY). ONEIDA CO.: banks of Mohawk River, Utica, June 4, 1904, *Haberer 922* (G). WAYNE CO.: Lyons, 1871, *Hankenson* (NY). TOMPKINS CO.: alluvial soil, Negundo Woods, Ithaca, July 6, 1920, *Muenschler & Bechtel 114* (US, WS); valley of Inlet, Ithaca, June 24, 1915, *Thomas 3751* (G); rich soil, corner of West Danby and Newfield state roads, Ithaca, June 11, 1919, *Wiegand 11789* (M). SCHUYLER CO.: Cayuta Shops Flat, June 17, 1887, *Millsbaugh* (FM). CHEMUNG CO.: banks of large streams, without locality, June 11, 1894, *Lucy 2643* (FM).

NEW JERSEY. SUSSEX CO.: Montague Tp., July 16, 1909, *Nash* (NY); Franklin, July, 1875, *Rusby* (UM); Peters Valley, June 1, 1895, *Van Sickle* (US). WARREN CO.: alluvial woods, Delaware River, Belvidere, June 5, 1921, *Mackenzie* (NY). BERGEN CO.: woods, Schraalenburgh, June, 1890, *Cuthbert* (UF); Carlstadt, June 1, 1884, *Niederer* (NYCP). HUDSON CO.: hills back of Hoboken, July, 1847, *without collector* (NY). ESSEX CO.: Millburn, Aug. 4, 1891, *Lighbipe* (NY). MIDDLESEX CO.: near Milltown, near New Brunswick, July 29, 1890, *Vail* (NY). MONMOUTH CO.: Pine Brook road, 2 or 3 mi. s. of Eatontown, Sept. 3, 1923, *Beals, Bassett & Sluyter* (G). BURLINGTON CO.: Kinkora, Aug. 18, 1910, *Taylor 2544* (NY). CAPE MAY CO.: Avalon, June 15, 1925, *Leeds* (M). COUNTY NOT DETERMINED: S. Holland, July 18, 1914, *Miller 1557* (NY).

PENNSYLVANIA. BUCKS CO.: George School woods, June 2, 1906, *Eves* (M); woods, 2½ mi. w. of Durham, Springfield Tp., Aug. 13, 1933, *Witte* (RM). MONTGOMERY CO.: without locality, *ex herb.* *Martindale* (G). PHILADELPHIA CO.: Philadelphia, *Morong* (M). DELAWARE CO.: meadows, without locality, June, 1861, *ex herb.* *Canby* (NYCP); moist soil, Chester Heights, Aston Tp., July 31, 1914, *Pennell 1613* (NY); Crum Creek, near Philadelphia, June 7, 1870, *Redfield 8187* (M). CHESTER CO.: without locality, June 5, 1882, *Fergus* (FM); Spread Eagle, June, 1870, *Martindale* (US). BERKS CO.: wooded hill, Moselem Springs, July 4-8, 1915, *Britton* (NY). LANCASTER CO.: Cone-wago, May, 1889, *Eby* (M); Reinholdsville, Aug. 26, 1889, *Small* (FM). BUTLER CO.: alluvial thickets along Connoquenessing Creek, Ribold, Sept. 18, 1932, *Bright 7761* (Minn), June 28, 1936, *13702* (WS). WASHINGTON CO.: rich woodlands along Mingo Creek, Old Distillery Station, May 28, 1938, *Bright 16324* (WS). COUNTY NOT DETERMINED: meadows, Avondale, June, 1896, *ex herb.* *Canby* (NYCP).

DELAWARE. NEW CASTLE CO.: New Castle, 1886, *ex herb.* *Tatnall* (G).

MARYLAND. HARFORD CO.: Spesutie Island, May 26, 1879, *Smith* (US). ANNE ARUNDEL CO.: without locality, May 29, 1878, *Smith* (US). PRINCE GEORGES CO.: between Seabrook and Buena Vista, May 31, 1915, *Maxon 6142* (US); wet woods along Sligo Branch, near the mouth, May 27, 1915, *Standley 11585* (US). MONTGOMERY CO.: Glen Echo, May 19, 1895, *Pollard 261* (US); damp woods, n. of Chevy Chase Lake, May 30, 1911, *Standley 5976* (US); Garrett Park, June 2, 1895, *Topping* (Minn).

DISTRICT OF COLUMBIA. Vicinity of Washington, June 12, 1878, *Chickering* (C, M); pine woods, Dalecarlia Reservoir, May 23, 1905, *Painter 1309* (M); High Island, May 10, 23, 1877, *Ward* (US); Fort Scott, May 15, 1879, *Ward* (US); Woodley Park, June 25, 1879, Sept. 18, 1880, *Ward* (US); alluvial soil, margin of large island, n. w. of Sycamore Island, May 12, 1918, *Wherry* (G, US).

VIRGINIA. PRINCESS ANNE CO.: rich woods, e. of Little Creek, May 4, 1935, *Fernald & Griscom 4355* (G). SUSSEX CO.: dry sandy hickory and oak woods, Burts, July 24, 25, 1936, *Fernald & Long 6155* (G). HENRICO CO.: Richmond, May 13, 1894, *Churchill* (G); Richmond, *De Chalmot* (US). BEDFORD CO.: banks of streams, without locality, June 5, 1868, *Curtiss* (FM); river bank and low rich woods, without locality, June 1, 1871, *Curtiss* (G). GILES CO.: Salt Pond Mt., June 1, 1890, *Brown, Hogg, Vail, Timmerman, Britton & Britton* (NY). SMYTH CO.: riverside, vicinity of Marion, May 22, 1892, *Britton, Britton & Vail* (NY); bluffs of Middle Fork Holston River, Marion, May 22, 1892, *Small* (FM, M, MS, US TYPE of *P. virginicum* Greene); along Nicks Creek, near base of Pine Glade Mt., June 2, 1892, *Small* (FM); south slope of White Rock Mt., June 21, 1892, *Small* (FM).

WEST VIRGINIA. HAMPSHIRE CO.: Hanging Rock, July 9, 1932, *Frye* (Minn). GREENBRIER CO.: White Sulphur Springs, July 16, 1892, *Brown* (NY). FAYETTE CO.: without locality, May 28, 1892, *Nuttall 788* (WVU). SUMMERS CO.: near Bellpoint, May 9, 1932, *Boone 93* (WVU). MONONGALIA CO.: Warm Hollow, July 8, 1939, *Davis & Davis 2746* (WVU); fence row, The Flats, June 4, 1890, *Millsbaugh 162* (NY, WVU); Dents Run, June 5, 1940, *Myers* (WVU). BROOKE CO.: along creek, Schubert farm, June 4, 1942, *Schubert* (WVU). OHIO CO.: damp woods, Nichols Hill, Wheeling, May 23, 1937, *Bartholomew 365* (WVU); near Bethany Pike, Oglebay Park, June 21, 1929, *Strausbaugh* (WVU). WETZEL CO.: Rocky Run, near Pine Grove, June 17, 1931, *Haught 439* (WVU). WIRT CO.: damp shaded bank of Little Kanawha River, ½ mi. above mouth of Reedy Creek, June 23, 1934, *Bartholomew 93* (WVU). CABELL CO.: bank of Guyan River, near junction of Russell Creek, June 19, 1937, *Gilbert 589* (WVU). LINCOLN CO.: Hamlin, May 28, 1933, *Harris* (WVU). WAYNE CO.: Dickson, May 12, 1931, *Gilbert 185* (WVU); Wayne, May 27, 1933, *Harris* (WVU); near Ft. Gay, May 7, 1932, *Lycan 17* (WVU).

NORTH CAROLINA. MADISON CO.: wooded slope, French Broad River, near Hot Springs, Aug. 14, 1924, *Wehmeyer 638* (UM). BUNCOMBE CO.: river banks, Biltmore, May 20, 1896, *ex herb.* *Biltmore 1298* (Minn, RM, US). POLK CO.: rich woods, White-oak Mt., Columbus, July 21, 1921, *Peattie 1002* (G); side of Tryon Range, near Columbus, May 10, 1899, *Townsend* (WS). SWAIN CO.: vicinity of Swayney, Sept. 22, 1913, *Mooney* (US). MACON CO.: deep rich soil bordering water-courses, Highlands, May 25, 1897, *ex herb.* *Biltmore 1298b* (G, M, NY, US); Lake Satulah Falls, Highlands, June 8,

1901, Magee (G).

SOUTH CAROLINA. ANDERSON CO.: damp woods, Gluck Mill, Sept. 4, 1917, Davis 7194 (M, RM). AIKEN CO.: Aiken, July, 1869, Ravenel (US).

GEORGIA. RICHMOND CO.: island in Savanna River, 16 mi. above Augusta, April 27, 1904, Cuthbert 1090 (UF). MCDUFFIE CO.: woods, 2 mi. w. of Thomson, Sept. 17, 1908, Bartlett 1417 (UM). COBB CO.: small knob, Kennesaw Mt., May 12, 1934, Perry & Myers 822 (G, NY). FLOYD CO.: cliffs of the Coosa River, 1872, Ravenel (M).

ALABAMA. DEKALB CO.: shaded rocky banks, Lookout Mt., 1900 ft. alt., Hotel de Kalb, Mentone, June 4, 1892, Mabr (US). LEE CO.: Auburn, May 8, 1897, Earle & Baker (NY).

MICHIGAN. MACOMB CO.: Washington, Cooley (MS). OAKLAND CO.: Parkedale Farm and Rochester, various dates, 1912 to 1917, Farwell 2983, 3473, 3673 TYPE of *P. ellipticum* Farwell, 3674, 3675, 3676, 3677, 3677½, 3678, 3679, 3682 TYPE of *P. canaliculatum* var. *oblongifolium* Farwell, 3683, 3981½, 4236a, 4237a, 4508½ TYPE of *P. biflorum* var. *ovatum* subvar. *ellipsoidale* Farwell (Farwell; several of these numbers also at G and NY, but localities or dates not always corresponding). WAYNE CO.: Detroit, near Mich. So. R. R., June 25, 1871, ex herb. Boott (G); woods on Belle Ile, June 8, 1893, Farwell 1150a (Farwell TYPE of *P. biflorum* var. *ovatum* Farwell); open dryish fields, Rockwood, June 24, 1916, Farwell 4234 (Farwell), 4235 (Farwell, G). WASHINGTON CO.: Ann Arbor, June 15, 1860, Almendinger (UM); bank of Huron River, w. of Ann Arbor, June 30, 1924, Erlanson 120 (UM); woods, near Ypsilanti, June 13, 1891, Farwell 1150 (Farwell); moist wooded hillside, left bank of Huron River, just above city beach, Ann Arbor, Aug. 20, 1924, Gustafson & Best (UM); edge of low woods, Nichols Arboretum, Ann Arbor, June 30, 1935, Hermann 6832-a, 6832-b (FM, MS), 6832-c (FM); Cedar Bend, Ann Arbor, July 12, 1915, LaRue (UM); Huron River Terr., Ann Arbor, June 7, 1903, Thomson (UM); woods, w. of Ann Arbor, June 23, 1838, ex herb. Thurber (G); near Ypsilanti, June 15, 1870, Whitney (UM). INGHAM CO.: Agricultural College, June 16, 1887, Cooley (MS); bank of Red Cedar River, Agricultural College, June 26, 1895, Skeels (MS); moist open woods, Lansing, June 7, 1917, Yuncker 184 (US). JACKSON CO.: 3 mi. e. of Hanover, June 28, 1937, Anderson & Peck (WS). CALHOUN CO.: s. of Marshall, Aug. 2, 1898, Beal (MS). KENT CO.: Grand Rapids, June 27, 1892, July 7, 1893, Bailey (UM); Grand Rapids, June, 1886, Crozier (NY, US); Grand Rapids, Aug. 21, 1935, Rusby (NY). KALAMAZOO CO.: shady spot, roadside, Schoolcraft, June 6, 1903, Burgess 55 (FM); in lane leading to lake, Sugarloaf Lake, June 16, 1903, Burgess 155 (FM); roadside, Schoolcraft, Sept. 30, 1903, Burgess 397 (FM); fence row, Sugarloaf Lake, Oct. 3, 1903, Burgess 460 (FM). ST. JOSEPH CO.: between Mud Lake and Clear Lake, June 27, 1937, Anderson (WS); Constantine, June 9, 1903, Davis (WS). VAN BUREN CO.: South Haven, July 6, 1910, Pennington (UM); wooded bank, Keeler, 1906, Pepoon 763 (MS). BERRIEN CO.: flood plain, Warren Woods, May 18, 1921, Billington (UM).

OHIO. WAYNE CO.: Wooster, July 4, 1907, Laughlin 970 (G). LORAIN CO.: woods, Oak Point, June 8, 1895, Ricksecker (US). ERIE CO.: Cedar Point, May 29, 1894, Moseley (M). RICHLAND CO.: waste ground, without locality, June 20, 1892, Wilkinson (Minn). FRANKLIN CO.: Columbus, May 30, 1898, Colevenger (US). CHAMPAIGN CO.: near Urbana, June 23, 1838, without collector (UM). CLARK CO.: Springfield, Williams (M). BUTLER CO.: moist woods, Oxford, June 22, 1910, Overholts (M). HAMILTON CO.: edge of woods, Mt. Airy Forest, Cincinnati, June 8, 1931, Stephenson (RM).

INDIANA. STEUBEN CO.: middle of high wooded black oak slope, north side of Cheeseboro Lake, S. 19, 3½ mi. n. w. of Angola, June 22, 1937, Deam 57888 (D); woods, near Lake Gage, June 16, 1903, Deam (D). LAGRANGE CO.: white oak woods, 3 mi. e. of Howe, June 5, 1915, Deam 15911 (D); woods, north side of Cedar Lake, June 12, 1916, Deam 20180 (D); base of sandy black oak slope, 1 mi. s. of Mongo, Sept. 14, 1918, Deam 26335 (D); black and white oak woods, 1½ mi. s. e. of Mongo, July 13, 1923, Deam 39093 (D); in sphagnum, tamarack bog along Pigeon River, 1½ mi. s. e. of Mongo, June 17, 1937, Deam 57860 (D). NOBLE CO.: dry woods, 4 mi. s. e. of Ligonier, June 26, 1914, Deam 14346 (D); moist woods, 5 mi. s. w. of Albion, Aug. 25, 1914, Deam 14697 (D); sandy soil, school-house grounds, north side of Blackman Lake,

1 mi. e. of Kimmel, July 1, 1924, *Deam 40780* (D). WHITLEY CO.: black and white oak woods, north side of New Lake, 9 mi. n. w. of Columbia City, July 1, 1924, *Deam 40779* (D). ADAMS CO.: without locality, Aug. 1, 1900, *Kauffmann* (UM). HUNTINGTON CO.: bank of Salamonie River, 3 mi. n. w. of Warren, Aug. 15, 1924, *Deam 40948* (D). JAY CO.: woods, Godfrey Indian Reserve, S. 20, 3 mi. n. w. of Pennville, June 11, 1931, *Deam 50258* (D). DELAWARE CO.: river bank, 1 mi. e. of Eaton, June 4, 1911, *Deam 8532* (D). WAYNE CO.: woods, 3½ mi. n. w. of Richmond, June 4, 1913, *Deam 13136* (D). UNION CO.: wooded ravine, 3 mi. s. of Liberty, June 16, 1915, *Deam 16006* (D). DECATUR CO.: along a fence along a woods, 5 mi. s. of Greensburg, May 31, 1921, *Deam 34171* (D). DEARBORN CO.: wooded ravine, ½ mi. w. of Aurora, June 17, 1915, *Deam 16038* (D); wooded bank of Laughery Creek, 4 mi. w. of Aurora, June 18, 1915, *Deam 16109* (D). RIPLEY CO.: wooded hillside along Laughery Creek, just e. of Versailles, July 23, 1913, *Deam 13789* (D). JENNINGS CO.: wooded area, 5 mi. s. e. of Vernon, May 22, 1942, *Friesner 16681* (WS). SWITZERLAND CO.: wooded hillside, just n. of Vevay, July 25, 1913, *Deam 13824* (D). JEFFERSON CO.: Hanover, June 17, 1874, *Coulter* (FM). CLARK CO.: without locality, May 6, 1851, *Mohr* (US). ELKHART CO.: woods, river bank, 1½ mi. n. of Middlebury, June 4, 1912, *Deam 10966* (D). MARSHALL CO.: Long Point, near Lake Maxinkuckee, June 17, 1901, *Clark 1774* (NY, US); woods, south side of Lake Maxinkuckee, Sept. 14, 1921, *Deam 34769* (D); Lake Maxinkuckee, Aug. 8, 1899, *Evermann 950* (US). FULTON CO.: woods along Tippecanoe River, just n. of DeLong, June 7, 1920, *Deam 30982* (D). MIAMI CO.: border of woods, 1 mi. n. w. of Denver, June 30, 1922, *Deam 36797* (D). GRANT CO.: woods, 2 mi. n. e. of Van Buren, June 16, 1907, *Deam 2049* (D). JACKSON CO.: slope of wooded beech ravine, 1 mi. w. of Medora, July 15, 1919, *Deam 28129* (D). FLOYD CO.: base of wooded slope, 2 mi. w. of New Albany, June 13, 1919, *Deam 27931* (D). HARRISON CO.: near base of wooded slopes, Falling Springs Hollow, 3 mi. e. of Elizabeth, June 1, 1917, *Deam 23336* (D). STARKE CO.: black oak woods, 6 mi. n. e. of North Judson, June 27, 1930, *Deam 49007* (D). PULASKI CO.: wooded bank, Tippecanoe River, 3½ mi. n. e. of Winamac, June 9, 1923, *Deam 38831* (D). WHITE CO.: black oak clearing, 2½ mi. s. of Lee, Sept. 17, 1921, *Deam 34906* (D). TIPPECANOE CO.: woods, 1½ mi. n. e. of Romney, May 25, 1922, *Deam 36063* (D). BOONE CO.: roadside, 4 mi. n. of Lebanon, June 19, 1943, *Friesner 17749* (WS). HENDRICKS CO.: wooded creek bottom, White Lick River, June 22, 1912, *Deam 11236* (D). PUTNAM CO.: woods, 2 mi. s. w. of Morton, Aug. 24, 1922, *Deam 37821* (D); Greencastle, May, 1893, *Underwood* (NY). MORGAN CO.: low wooded bank, White River, 1¼ mi. s. e. of Paragon, May 21, 1922, *Deam 35866* (D). MONROE CO.: near "Phi Delt" house, Bloomington, June 7, 1923, *Hawkin* (UF). GREENE CO.: along railroad, ½ mi. e. of Bushrod, May 26, 1912, *Deam 10682* (D). LAWRENCE CO.: wooded bluff, [East Fork of] White River, ¼ mi. e. of Tunnelton, May 16, 1918, *Deam 24812* (D). DAVIESS CO.: wooded bank, [East Fork of] White River, just e. of the Portersville Bridge, July 17, 1919, *Deam 28221* (D). CRAWFORD CO.: roadside, ½ mi. s. of Marengo, June 7, 1919, *Deam 27777* (D, G); wooded slopes, Grantsburg, June 9, 1919, *Deam 27801* (Farwell). PERRY CO.: wooded bluff, Ohio River, 5 mi. e. of Cannelton, June 29, 1915, *Deam 16626* (D). SPENCER CO.: dry woods, 3 mi. w. of Troy, June 30, 1915, *Deam 16656* (D). WARRICK CO.: high wooded bank, Cypress Creek, 2 mi. e. of Newburg, June 11, 1918, *Deam 25301* (D). PORTER CO.: woodlands, without locality, June 28, Aug. 11, 1929, *Buhl 103* (FM). LAKE CO.: north slope, low wooded dune, ½ mi. e. of East Gary, June 10, 1922, *Deam 36458* (D); sandy wooded ridge, 2½ mi. n. w. of Hobart, July 18, 1931, *Deam 50553* (D); rich woods, Valparaiso, May 23, 1900, *Lansing 824* (FM); dry sandy woods, Clarke, Sept. 3, 1903, *Lansing 1849* (FM). JASPER CO.: black oak sand hill, 5 mi. w. of Gifford, July 14, 1920, *Deam 31706* (D). FOUNTAIN CO.: along creek, near Veedersburg, June 5, 1905, *Deam* (D); on crest of white and black oak ridge, Portland Arch Park, near Fountain, Aug. 15, 1932, *Deam 52835* (D). KNOX CO.: wooded border of Claypool Pond, 15 mi. s. w. of Decker, July 8, 1915, *Deam 17000* (Minn). GIBSON CO.: woods, Gordon Hills, 6 mi. w. of Patoka, July 6, 1915, *Deam 16905* (D). POSEY CO.: wooded ravine, 4 mi. s. of Mt. Vernon, May 24, 1911, *Deam 8322a* (D).

KENTUCKY. HARLAN CO.: top of Big Black Mt., near state line, June 17, 1936, *Camp 1492* (NY). SCOTT CO.: Elkhorn Cliff, Stamping Ground, May 12, 1930, *Singer* (US). WARREN CO.: Bowling Green, June, 1899, *Price* (M). LYON CO.: Kuttawa, June 2-18, 1909, *Eggleston 4579* (NY). COUNTY NOT DETERMINED: moist shady thicket, Elk Lick Falls, May 19, 1923, *McFarland 99* (M, US).

TENNESSEE. SEVIER CO.: rocky ravine, Elkmont, July 29, 1924, *Webmeyer 378* (UM). KNOX CO.: woods, Knoxville, April, May, 1898, *Ruth 140, 735* (US), *147, 749* (NY), *148, 781* (M). CHEATHAM (?) CO.: limestone of Harpeth River, w. of Nashville, May 17, 1934, *Harger 7807A* (G). HENDERSON CO.: moist sandy hillsides, near Lexington, May 20, 1920, *Palmer 17575* (M).

WISCONSIN. BROWN CO.: DePere, June 23, 1888, *Kellogg* (US); Wrightstown, Aug. 17, 1879, *Schuetz* (FM); Bellevue Creek, June 13, 1880, *Schuetz* (FM); Fort Howard, June 18, 1881, *Schuetz* (G); copses, Fort Howard marsh, June 26, 1886, June 26, 1887, *Schuetz* (FM); Kellogg stockfarm, Allouez, June 27, 1897, *Schuetz* (FM, NY); Green Bay, June 22, 1898, *Schuetz* (FM). RACINE CO.: Racine, Sept. 11, 1879, *Davis* (M). WALWORTH CO.: Lake Geneva, *Ayer* (FM); vicinity of Delavan, July 11, 1919, *Hollister 43* (US); 1½ mi. n. w. of Lake Geneva, 1885, *Scoville* (RM); margin of woods, near Lake Geneva, *Scoville* (RM). DANE CO.: Madison, Aug. 25, 1893, *Churchill* (G). SAUK CO.: woods, Mirror Lake, July 13, 1903, *Eggert* (M). RICHLAND CO.: rich soil, wooded hillside, ½ mi. e. of Richland Center, June 7, 1912, *Lansing 3421* (FM). JUNEAU CO.: Camp Douglas, July 16, 1890, *Mearns 666* (US). BUFFALO CO.: near Fountain City, *Finkelnburg* (Minn). POLK CO.: St. Croix Falls, July 18, 1900, *Baker* (G).

ILLINOIS. LAKE CO.: beach, n. of Waukegan and e. of the glacial Glenwood Ridge, June 16, 1909, *Gates 3025* (UM). COOK CO.: edge of woods, Palos Park, May 24, 1913, *Johnson* (NY); woods, near Chicago, June 30, 1892, June 29, 1891, *Moffatt 171, 329* (Minn); Stony Island, June 25, 1914, *Smith 5932* (G, M). DU PAGE CO.: railroad, Lisle, June 4, 1918, *Martinek 191* (US); woods, Naperville, May 9, 1895, *Umbach* (Minn), May 21, 1895, *Umbach* (US), June 16, 1898, *Umbach 1040* (G). KANE CO.: shaded ground, Bliss Woods, 7 mi. w. of Aurora, July 30, 1925, *Erlanson 1547* (UM). LA SALLE CO.: rich shady woods, Starved Rock, June 1-7, 1909, *Greenman, Lansing & Dixon 9* (G, NY). PEORIA CO.: moist woods, Peoria, June, 1904, *McDonald* (G). ROCK ISLAND CO.: Port Byron, Aug. 11, 1892, *ex herb. Harper* (WS). HENDERSON CO.: moist shaded sand dunes, Oquawka, July 7, 1908, *Gleason* (G). CHAMPAIGN CO.: shady bank, Crystal Lake, Urbana, May 23, 1911, *Pease 13090* (G). RICHLAND CO.: near Bird Haven, 2½ mi. n. of Olney, May 10, 1910, *Ridgway* (US); Larchmound, Olney, May 20, 1919, *Ridgway 807* (G). WHITE CO.: wooded hillsides, Grayville, June 22, 1919, *Palmer 15575* (M). POPE CO.: rocky hillside woods, Golconda, June 5, 1919, *Palmer 15367* (M). JOHNSON CO.: rocky hillside woods, Vienna, Apr. 28, 1919, *Palmer 14984* (M). ALEXANDER CO.: low rich woods, Olive Branch, May 10, 1919, *Palmer 15098* (M). ST. CLAIR CO.: Carondelet, Sept. 4, 1891, *Douglass* (M).

MINNESOTA. HOUSTON CO.: sandy soil, hillside, Spring Grove, June 5, 1902, *Rosendahl 351* (Minn); Winnebago Valley, June 12, 1899, *Wheeler 184* (Minn). WINONA CO.: Winona, June, July, 1912, *Freiberg* (M); dry sandy soil and stony side of bluffs, without locality, June, 1886, *Holzinger* (Minn). WABASHA CO.: woods, Lake City, May, 1881, *Hammond 43* (Minn); near Lake City, June 14, 1883, *Manning* (Minn). OLMSTEAD CO.: Rochester, Lat. 44, June 17, 1902, *Ainslie 1040* (Minn). GOODHUE CO.: Cannon Falls, May, 1881, *Sandberg* (Minn). RAMSEY CO.: St. Paul, June 20, 1899, *ex herb. Moore & Moore* (RM). HENNEPIN CO.: rich woods, near Minneapolis, June, 1892, *Burglehaus* (Minn, MS); Lake Harriet, Sept. 15, 1896, *Heller* (Minn); Minneapolis, June 13, 1877, June, 1878, *Herrick* (Minn); Minneapolis, June, 1878, *Kassube* (Minn); Fort Snelling, June 9, 1891, *Mearns* (US); Fort Snelling Reservation, June 19, 1909, *Rosendahl 2132* (Minn); Minneapolis, June, 1895, *Sheldon* (Minn). CARVER CO.: Chaska, June, 1891, *Ballard 67, 69* (Minn). RICE CO.: Northfield, 1912, *without collector G. 139* (Minn). LE SUEUR CO.: Elysian, June, 1891, *Sheldon 41* (Minn); Elysian, June, 1891, *Taylor 34* (Minn). NICOLLET CO.: Middle Lake, June, 1892, *Ballard 969* (Minn). WASECA CO.: Janesville, June, 1891, *Taylor 118a, 262* (Minn). BLUE EARTH CO.: Madison Lake, June,

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1891, *Sheldon 116* (Minn). STEARNS CO.: St. Cloud, June, 1897, *Campbell* (FM, Minn). MEEKER CO.: Litchfield, June, 1892, *Frost* (Minn). KANDIYOHI CO.: Willmar, June, 1912, *without collector 89* (Minn). ROSEAU CO.: Oak Point, July, 1894, *MacMillan & Sheldon 1098* (Minn). POLK CO.: Crookston, Aug., 1900, *MacMillan & Skinner* (Minn). CLAY CO.: rich woods, Moorhead, June 18, 1929, *Solheim 205* (RM). OTTERTAIL CO.: Battle Lake, Aug., 1892, *Sheldon 3357* (Minn). JACKSON CO.: vicinity of Heron Lake, June 10, 1902, *Skinner 45* (Minn). PIPESTONE CO.: Pipestone, June, 1895, July, 1896, *Menzel* (Minn). ROCK CO.: at base of mound, Luverne, Sept. 10, 1901, *Wheeler 1068* (Minn).

IOWA. WINNESHIEK CO.: rich woods, without locality, June 18, 1895, *Fitzpatrick & Fitzpatrick 2643* (G). FAYETTE CO.: wooded hillsides, Fayette, July, 1893, *Fink* (G); rocky hillside, without locality, June 28, 1894, *Fink 572* (US). BLACKHAWK CO.: Snag Creek woods, June 14, 1929, *Burk 343* (M); clay soil, Cedar Falls, July 7, 1926, *Pammel 263* (G, M); sandy soil, woods and islands of Cedar River, Island Y.M.C.A. Camp, Cedar Falls, July 9, 1925, *Pammel 663* (G). JOHNSON CO.: woods, without locality, June 13, 1900, *Fitzpatrick & Fitzpatrick* (D); Iowa City, *Hitchcock* (M). POWESHIEK CO.: Grinnell, 1886, *Norris* (M). VAN BUREN CO.: rich woods, Bentonsport, June, 1920, *Graves 1719* (M); Stockport, June, 1925, *Graves 2055* (M). DECATUR CO.: moist woods, Decatur, June 29, 1904, *Anderson* (RM); low rich woods, without locality, June 6, 1898, *Fitzpatrick & Fitzpatrick* (FM, RM). SHELBY CO.: without locality, May 30, 1894, *Fitzpatrick & Fitzpatrick* (M, MS). WOODBURY (?) CO.: ravines, "Sargent's hill" [Sargeant Bluff?], June, 1853-54, *Hayden* (M).

MISSOURI. SCOTLAND CO.: woods, north side of Wyaconda River, near Azen, June 30, 1933, *Palmer & Steyermark 40982* (M, NY); along North Fork of Fabius River, w. of Memphis, June 30, 1933, *Palmer & Steyermark 41000, 41001* (M). MARION CO.: Hannibal, May, 1906, Aug. 1, 1914, June 20, 1915, *Davis 1200, 3105, 6588* (M); Scipio, July 24, 1915, *Davis 4775* (M); church-yard slopes, Withers Mill, July 14, 1917, *Davis 7545* (M). SHELBY CO.: near Bethel, June 29, 1933, *Palmer & Steyermark 40914* (M). MACON CO.: Ethel, June 12, 1915, *Bush 7622* (M). LINN CO.: without locality, May 30, 1937, *Crookshanks 15* (M). RALLS CO.: Ilasco, Aug. 20, 1911, *Davis 987* (M); Bear Creek bluffs, near Oakwood, June 2, 1916, *Davis 1290* (M); near New London, June 27, 1933, *Palmer & Steyermark 40716* (M). PIKE CO.: Norris farm, near Eolia, Aug. 26, 1916, *Davis* (M, Minn). LINCOLN CO.: Silex, May 29, 1915, *Davis* (M). ST. CHARLES CO.: Gilmore, May 26, 1917, *Davis 7372* (M). ST. LOUIS CO.: rich woods, Allenton, May 20, 1918, *Churchill* (G); Allenton, May 26, 1886, *Eggert* (M); Jefferson Barracks, *Eggert* (M); Ramona Park, June 8, 1907, *Fullgraf* (M); near St. Louis, June 20, 1892, *Glatfelter* (UM); Windsor Springs, July 1, 1890, *Hitchcock* (M); Jefferson Barracks, July 6, 1890, *Hitchcock* (M); Meramec Highlands, July 29, 1905, *Johnson* (M); Allenton, June 8, 1903, *Kellogg* (M); Allenton, June, 1902, *Letterman* (M, US); Allenton, Aug. 13, 1933, *Lodewyks 27* (M); Creve Coeur Lake, July 20, 1894, *Misch* (M); Meramec Highlands, May 23, 1897, *Norton & Ferguson* (M); St. Louis, July, Aug., 1891, *Trelease* (M). FRANKLIN CO.: Gray Summit, May 19, 1928, *Greenman 4545* (M); Gray Summit, May 25, 1927, *Kellogg 830* (M); St. Albans, June 5, 1930, *Kellogg 15144* (M); in shade, moist hillside, Pacific, May 15, 1921, *Payson 2460* (RM). JEFFERSON CO.: in moist rich shady soil, Antonia, May 30, 1937, *Barkley 1149* (M, WS); woods, near Victoria, Aug. 24, 1892, *Eggert* (M); Selma, May 30, 1923, *Greenman 4283* (M); Victoria, Aug. 7, 1890, *Hitchcock* (M); Kimmswick, June 7, 1885, *Wislizenus 414* (M). WASHINGTON CO.: woods, near Mineral Point, May 29, 1892, *Eggert* (M). PERRY CO.: 1 mi. n. of Menfro, July 30, 1934, *Steyermark 14041* (M). MADISON CO.: Mine La Motte, May 19, 1927, *Greenman* (M). IRON CO.: along railroad, near Vulcan, May 6, 1908, *Smith 311* (FM); woods, Des Arc, May 12, 1908, *Smith 380* (FM); Ironton, June 18, 1897, *Savage & Stull 197* (FM). WORTH CO.: 1 mi. s. of Denver, Aug. 30, 1934, *Steyermark 15053* (M). GENTRY CO.: low woods, along East Fork of Grand River, 3 mi. n. w. of Albany, Aug. 29, 1934, *Steyermark 15014* (M). ATCHISON CO.: Watson, June 1, 1894, *Bush 527* (M). CALDWELL CO.: 6 mi. n. of Cowgill, Aug. 26, 1934, *Steyermark 14884* (M). CLINTON CO.: 6 mi. s. of Cameron, Aug. 27, 1934, *Steyermark 14918* (M). CLAY CO.: without locality, July 18, 1933, *Bush 12690* (M). JACKSON

co.: Independence, June 7, 1894, *Bush* 533 (M); prairies, Lake City, June 2, 1915, *Bush* 7565 (G, M, NY, US); Courtney, June 7, 8, 17, 1917, *Bush* 7996 (M), 7996A (NY), 8000 (M, US), 8000A (NY, US), 8002 (M); Swope Park, June 9, 1917, *Hoffmann* (M). JOHNSON CO.: rich woods, near Columbus, June 22, 1930, *Palmer* 36717a (M). CASS CO.: without locality, June 9, 1864, *Broadhead* (M). COOPER CO.: Otterville, May 19, 1936, *Bush* 15523 (M). MORGAN CO.: low slopes, along Procter Creek, July 7, 1934, *Steyermark* 13194 (M). PHELPS CO.: Jerome, May 28, 1914, *Kellogg* 537 (M). ST. CLAIR CO.: Osceola, July 28, 1933, *Bush* 12804 (M). CEDAR CO.: n. of Bear Creek P. O., July 16, 1934, *Steyermark* 13548 (M). GREENE CO.: Springfield, June 7, 1903, *Standley* (US); vicinity of Springfield, June 15, 1907, *Standley* (US); along railroad, s. e. of Springfield, Aug. 29, 1911, *Standley* 8392 (US); thin woods, vicinity of Strafford, Aug. 27, 1912, *Standley* 9499 (US). JASPER CO.: Webb City, June 14, 1903, *Palmer* 735 (M); low rich woods, Neck City, Aug. 16, 1919, *Palmer* 15872 (Farwell); Webb City, Aug. 18, 1919, *Palmer* 15922 (Farwell); near Reeds, June 2, 1924, *Palmer* 25259 (M). BARRY CO.: Flat Creek, May 19, 1936, *Bush* 15513 (M).

ARKANSAS. CRAIGHEAD CO.: Jonesboro to Lake City, July 5, 1927, *Demaree* 3582 (M). FULTON CO.: Mammoth Spring, June 1, May 14, 1924, *Wheeler* 14, 37 (FM). FAULKNER CO.: Arkansas River, 7 mi. w. of Conway, May 30, 1923, *Wheeler* 79 (FM). CARROLL CO.: Eureka Springs, May 15, 1914, *Palmer* 5624 (M). WASHINGTON CO.: near Farmington, May 4, 1925, *Palmer* 26987 (M).

LOUISIANA. NATCHITOCHE PARISH: sandy hillside woods, Chopin, April 21, 1915, *Palmer* 7335 (M, NY, US).

NORTH DAKOTA. RAMSAY CO.: moist woods, Devils Lake, July 1, 1905, *Lunell* 286 (Minn). BENSON CO.: thickets, Peninsula of Lake Ibsen, Aug. 15, 1906, *Lunell* 286, Aug. 27, 1909, 701 (Minn), Sept. 3, 1914, 1232 (Minn TYPE of *P. commutatum* var. *lineamentosum* Lunell, NY). BOTTINEAU CO.: prairies, Willow City, June 20, 1889, *Lunell* (RM). MCHENRY CO.: Towner July 21, 1908, *Lunell* (NY). WARD CO.: rich alluvial soil, river bank near picnic grounds, Oak Park, Minot, June 21, 1929, Sept. 2, 1929, *Lakela* 173 (Minn). CASS CO.: banks of Red River, Fargo, Sept. 29, 1933, *Nelson & Nelson* 1019 (RM). LAMOURE CO.: open woods, Adrian, June 27, 1912, *Bergman* 1822 (Minn). MORTON CO.: without locality, July 5, 1906, *Bell* 296 (M).

SOUTH DAKOTA. ROBERTS CO.: rich woods, Coulee, July, 1922, *Over* 14332 (US). GRANT CO.: Big Stone, Aug., 1894, *Williams* (RM). BROOKINGS CO.: Lake Oakwood, *Griffiths* (M); shady banks, Lake Hendricks, June 11, 1898, *Hepner* (RM); damp woods, Oakwood, May 23, 1902, *Johnson* (M); Warren woods, Brookings, June 11, 1898, *Lawrence* (WS); Brookings, Aug., 1924, *Moore* 1562 (Minn); Lake Campbell, Aug., 1924, *Moore* 1569 (Minn). HANSON CO.: Alexandria, May 11, 1911, *Weber* (UF). UNION CO.: thickets, Brule Creek, June 27, 1921, *Over* 13682, 13683 (US). CLAY CO.: woods, Vermillion, May 22, Aug. 1, 1911, *Visber* 4018 (FM, M), June 28, 1910, 4167 (M).

NEBRASKA. DIXON CO.: Ponca, June 14, 1893, *Clements* 2545 (G, Minn, US). CEDAR CO.: St. Helena, *Brubin* (M). CASS CO.: South Bend, May 12, 1900, *Hedgcock* (M). LANCASTER CO.: s. w. of Lincoln, June 5, 1900, *Hedgcock* (M); Lincoln, Aug., 1889, *Webber* (M, NY). GAGE CO.: moist woods, Beatrice, June 13, 1899, *Washburn* (US). NUCKOLLS CO.: without locality, July, Aug., 1899, *Hedgcock* (M). WEBSTER CO.: Red Cloud, June 8, 1904, *Bates* 3212 (Minn). THOMAS CO.: hillside, Middle Loup River, near Norway, June 22, 1893, *Rydberg* 1408 (US); dry hillside, near Plummer Ford, Dismal River, July 5, 1893, *Rydberg* 1483 (G, NY, US). LINCOLN CO.: Hershey, June 11, 1903, *Mell* 98 (US).

KANSAS. CRAWFORD CO.: 6 mi. s. e. of Pittsburg, June 21, 1929, *Rydberg & Imler* 165 (NY). RILEY CO.: Prospect Hill, near Manhattan, Sept. 28, 1923, *Nelson* (M); Manhattan, Aug. 26, 1892, *Norton* (C); woods, without locality, 1896, *Norton* 834 (G, M, NY, RM, US); Manhattan, Aug. 19, 1892, *Thompson* (M). LYON CO.: wooded hillsides, without locality, May 29, 1895, *Chamberlin* (WS). COWLEY CO.: without locality, June, 1898, *White* (M).

OKLAHOMA. OTTAWA CO.: moist woods, near Ottawa, Aug. 29, 1913, *Stevens* 2506 (G, Minn). ROGERS CO.: Catoosa, May 14, 1895, *Bush* 1282 (M). OSAGE CO.: on shady wooded creek bank, near Pawhuska, Aug. 9, 1913, *Stevens* 1999 (G, M, Minn, US).

PAYNE CO.: sandy wet soil, 2 mi. n. of Ripley, June 29, 1935, *Dillingham* (WVU).
 CREEK CO.: Sapulpa, July 27, 1894, *Bush* 578 (M). LOGAN CO.: shady hillside, Cimmaron Bluffs, near Guthrie, June 14, 1914, *Stevens* 3292 (G). MCCURTAIN CO.: near Shawneetown, Aug. 13, 1853, *Bigelow* (US); Boggy Creek, Shawneetown, *Bigelow* (NY).
 MURRAY CO.: Platt National Park, Oct. 31, 1935, *Merrill & Hagan* 1691 (FM). COMANCHE CO.: vicinity of Fort Sill, May 20, 1916, *Clemens* 11532 (M, RM). COUNTY NOT DETERMINED: chiefly on the False Washita, between Fort Cobb and Fort Arbuckle, 1868, *Palmer* 325 (NY, US).

TEXAS. HARDIN CO.: 7 $\frac{3}{4}$ mi. w. of Silsbee, Village Creek, Oct. 6, 1934, *Cory* 11169 (G).

MEXICO. NUEVO LEON: Mesa Canyon, mountains near Monterrey, July, 1933, *Mueller & Mueller* 339 (G, FM).

UNIDENTIFIED SPECIES

Convallaria birta Bosc ex Poiret in Lamarck, Encyc. Méth. Bot. 4:369. 1797.

Polygonatum birtum Pursh, Fl. Am. Sept. 1:234. 1814.

No species conforming to the original description of *Convallaria birta* is known from North America.

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Accepted scientific names are in Roman type; synonyms, in *italics*; a new name and a new combination, in **bold face** type.

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